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SOLID WASTE PRACTICES IN THE UNITED STATES AIR FORCE

Torsten Rothman, P.E.
Maj USAF BSC

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TECHNICAL REPORT NO. AFWL-TR-71-119

October 1971

AIR FORCE WEAPONS LABORATORY
Air Force Systems Command
Kirtland Air Force Base
New Mexico

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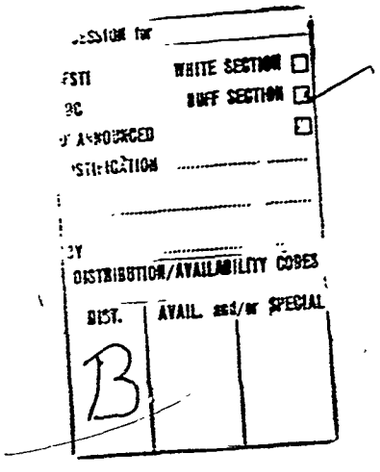

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FOREWORD

This research was performed under Program Element 63723F, Project 683MCC.

Inclusive dates of research were 1 July 1970 through 15 June 1971. The report was submitted 1 September 1971 by the Air Force Weapons Laboratory Project Officer, Lieutenant Joseph J. Beres (DEE).

This technical report has been reviewed and is approved.

Kenneth R Porter

JOSEPH J. BERES
Lt, USAF BSC
Project Officer

Kenneth R Porter

KENNETH R. PORTER
Major, USAF BSC
Chief, Solid Resources Section

Donald G Silva

DONALD G. SILVA
Major, USAF BSC
Chief, Environics Branch

William B. Liddicoet

WILLIAM B. LIDDICOET
Colonel, USAF
Chief, Civil Engineering Research Division

ABSTRACT

(Distribution Limitation Statement B)

A questionnaire survey of Air Force solid waste practices was conducted on all active Air Force installations. Information is presented on 98 major installations in the zone of interior (ZI) in the following areas: base and family housing solid wastes; grease disposal; garbage grinders; solid wastes generated in sewage treatment; pathological and classified wastes; liquid industrial wastes; fire fighting training, herbicides and pesticides; on-base landfill operations; and sedimentation from erosion.

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SECTION I

INTRODUCTION

1. GENERAL

A questionnaire survey of solid waste practices was conducted by the Air Force Weapons Laboratory (AFWL) of active Air Force installations in the Zone of Interior (ZI), Alaska, Canada, Greenland, Puerto Rico, and Guam. The purpose of the survey, which was conducted from December 1970 to January 1971, was to determine the scope of the solid waste management problem in the Air Force. (A copy of this questionnaire is included as appendix I.)

This report discusses the results of the survey for the 98 major installations in the ZI that are listed in AFM 11-4, Part 4, 1 July 1970. The Air Force Academy, Colorado, and the Aeronautical Chart and Information Center, St Louis, Missouri, are also included. The remaining installations, sites, stations, overseas bases, reserve units, etc. will be covered in a future technical report.

Included in this study are base and family housing wastes, grease disposal, pathological and classified wastes, liquid industrial wastes, fire fighting training, pesticide and herbicide disposal and storage, garbage grinders, solid wastes from sewage treatment, sanitary landfill operations, and sedimentation from erosion. Cost factors were omitted from the questionnaire.

The information is summarized and presented in the text and tables. The data from each base are included as appendixes. Much of the data, especially the base and family housing weight information, is not precise. However, to borrow a phrase from the Interim Report of the 1968 National Survey of Community Solid Waste Practices: "...securing of even rough estimates was considered to be a significant accomplishment ..." (Ref. 1).

This report is intended as an aid in providing information to civil and bioenvironmental engineers in the planning of solid waste management efforts. However, in comparing one base with another, great care must be taken to include intangibles such as mission, geography, climate, location, etc., all of which can greatly influence waste generation, collection, processing, and disposal. Direct comparison of individual factors, i.e., waste generation,

collection frequency, disposal method, etc., without due cognizance of these factors can lead to highly erroneous conclusions. It must be emphasized that even the application of average or median values found in this report as "typical" must be exercised with care because of the intangibles mentioned above.

In the national survey of civilian community solid waste practices, only 6 percent of the land disposal sites could be characterized as sanitary landfills (Ref. 1). It is the authors' opinion, based on experience, that the percentage is considerably higher for Air Force-operated landfills. This appears to be substantiated by the questionnaire data. Almost 100 percent of the questionnaires indicated sanitary landfill and only a few open dumps were reported, mostly in off-base locations. However, since sanitary landfill was not defined in the questionnaire, no attempt is made to distinguish between a true sanitary landfill and open dumping in this report. Both are included under the general heading of land disposal.

This report, in addition to covering the management of base and family housing refuse, briefly discusses grease disposal from dining halls, cafeterias, etc., and solids generated in sewage treatment. Quantitative information on family housing garbage grinders and their relationship to collection frequency is presented.

Pathological, classified, and liquid industrial wastes are covered in some detail. Fire fighting training is briefly discussed as well as pesticide and herbicide storage and disposal. Some comments regarding base solid-waste operations conclude the report.

Information received on sedimentation from erosion is presented in appendix VIII.

2. DEFINITIONS

The following definitions were supplied with the questionnaire:

Solid wastes: Garbage, refuse, and other discarded solid materials, including those resulting from commercial, industrial, and agricultural operations and community activities. Examples: household trash, food wastes, discarded furniture and appliances, tree trimmings, grass cuttings, dead animals, abandoned autos, sludges, and precipitations from water and wastewater treatment, construction and demolition wastes, wood crates, cardboard cartons, etc.

Industrial wastes: Those wastes directly attributable to industrial operations, i.e., solvents, oils, chemicals, etc.

Sanitary wastes: The water-borne wastes generated in living activities, i.e., excrement, food wastes (when garbage grinders installed), laundry water, etc.

Pathological wastes: Those wastes generated in the course of medical treatment or other activities, i.e., soiled bandages, bacteriological cultures, amputations, afterbirths, disposable hypodermic needles, etc.

Classified wastes: Paper, photographic film, reproduction masters, typewriter ribbons, etc., which must be destroyed for security reasons. Items that have and items, such as rough drafts, etc., that have not entered the security accountability system are included.

SECTION II

UNITED STATES AIR FORCE SOLID WASTE PRACTICES

The 1968 National Survey of Civilian Communities indicates that there is an average of approximately 5.32 pounds of solid waste collected per person per day in the United States (Ref. 1). This breaks down to about 3.0 pounds per person per day of household wastes and 2.32 pounds per person per day of wastes from commercial and industrial activities, constructions and demolitions, street sweepings, and miscellaneous sources. For comparison purposes this can be related to family housing wastes and base wastes, respectively.

1. BASE SOLID WASTES

a. Waste Generation

There are 98 bases included in this study; of these, 90 were able to furnish weight data for their base solid wastes. The total wastes generated by these 90 bases was 64,858.23 tons per month. Using the equivalent base population figure (per AFM 88-11), this yields an average of 5.11 pounds per person per day. The median value (that data point which half the values are greater than and half are less than) is 3.52 pounds per person per day. The range was from 0.14 at Kincheloe AFB, Michigan, to 37.82 pounds per person per day at McCoy AFB, Florida. A frequency distribution graph is shown in figure 1. Unusual values, high and low, as well as most other weight data were confirmed by telephone, some more than once. In many cases, accurate weight information is simply not available as there is no requirement to record it.

The median value of 3.52 pounds per person per day is fairly representative of a typical Air Force base. Such a base might have an equivalent population of perhaps 13,000 people. The per capita figure is expected to be somewhat higher than the 1968 National Survey figure of 2.32 pounds per person per day. The primary reasons are that refuse generation per se is steadily increasing, and a higher proportion of the overall wastes on an Air Force base are collected; whereas a lot of wastes in a civilian community go uncollected. An example of this is the substantial amount of urban wastes that are incinerated in apartment house or home incinerators or burned in backyards of residences and commercial establishments or on demolition sites (Ref. 3).

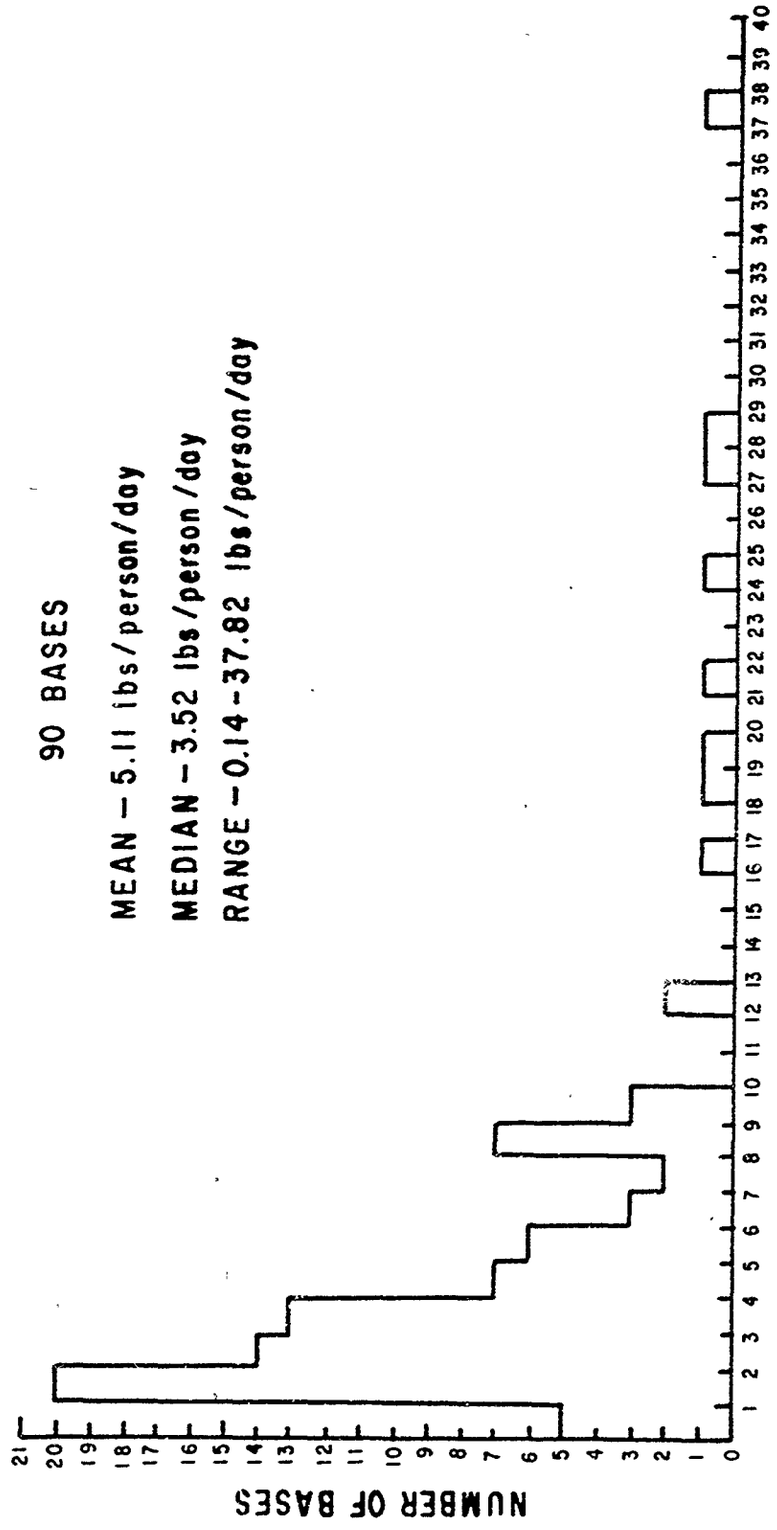

Figure 1. Base Solid Waste Frequency Diagram for Per Capita Production

b. Storage and Collection

Data for storage and collection of base solid wastes is available from all 98 bases. The breakdown of usage of storage containers by type is as follows: 34 bases use dumpsters exclusively; 4 bases use carbage cans exclusively; and 60 bases use some combination of both types of storage containers. When percent usage is considered, 84 bases store 75 percent or more of their solid waste in dumpsters; 6 store 75 percent or more in garbage cans; and the remaining 8 use some combination of containers where neither component is 75 percent or greater.

The collection of base solid wastes is mostly performed by Air Force personnel. On 52 bases Air Force personnel pick up all the base solid wastes; 15 bases use contract collection exclusively; and 31 bases use some combination of Air Force personnel and contractor collection. Air Force personnel pick up 75 percent or more of the base refuse on 71 installations while contractor personnel collect 75 percent or more on 24 bases.

The collection frequency varies from once per week to twice per day. The frequency is a function of the types of wastes generated. Those operations discarding highly putrescible materials (i.e., dining halls) or discarding very large volumes (i.e., commissaries) receive the most frequent service.

c. Density

The total volume of base solid wastes is 20,893,463 cubic feet per month from all 98 bases. The volume of wastes from the 90 bases that also reported weight data is 20,342,105 cubic feet per month. A frequency diagram of the densities for the 90 bases in pounds per cubic yard is shown in figure 2. The average density was calculated to be 172.17 pounds per cubic yard, and the median was found to be 194.59 pounds per cubic yard. There is a wide range of densities for refuse reported in the literature. Commonly quoted figures are 200 to 300 pounds per cubic yard for uncompacted refuse and 400 to 500 pounds per cubic yard for refuse in a compactor type collection vehicle. Densities calculated from the data in the questionnaire range from 23.98 pounds per cubic yard at Little Rock AFB, Arkansas, to 1505.54 pounds per cubic yard at McCoy AFB, Florida. The wide range found is probably due to the variations in the waste generation areas where the volume measurement is performed as well as to the uncertainty in much of the weight data. Volume of refuse is presently the only quantitative measurement which is required to be reported (see AFM 300-4, Vol. IV, pages 4 through 37, 1 October 1970, and AF Form 1452, "Daily

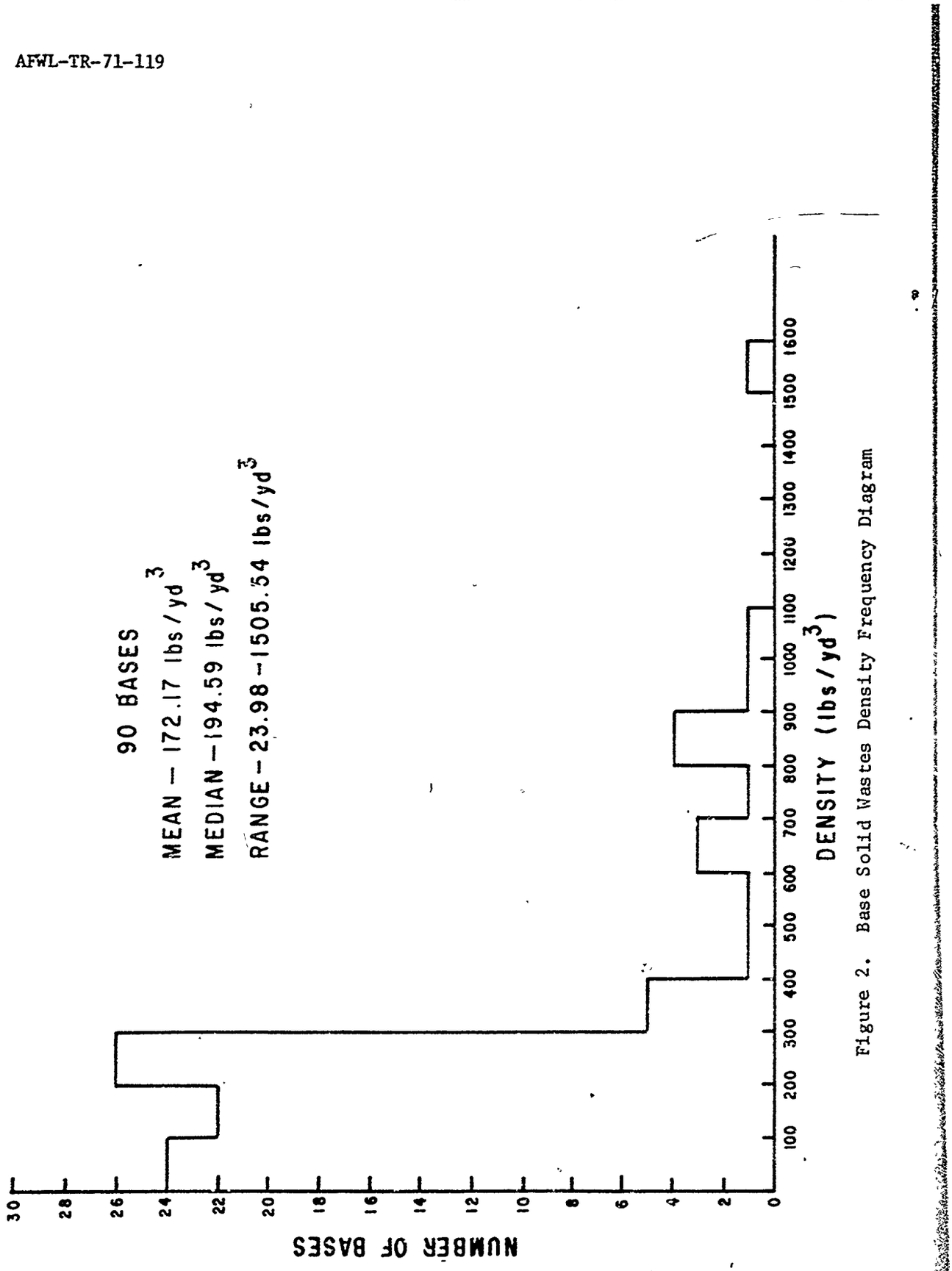

Figure 2. Base Solid Wastes Density Frequency Diagram

Log of Refuse and Salvage Collections"). It is required that the volume be reported as "loose" refuse. Instructions in the above mentioned references require adjustment of compacted volumes by an appropriate factor to be determined for each base and each type of material. This naturally leads to wide variation in calculated densities using the reported weight and volume figures.

d. Disposal

More than 95 percent of the base solid wastes are disposed of on land. Almost 2 percent is incinerated, another 2 percent is recycled, and a small fraction is fed to hogs. In the strict technical sense, incineration is a volume reduction technique, not a disposal method. In this report, however, it will be treated as a means of disposal since it was so reported in the questionnaire.

The quantities and methods for disposal are presented in table I.

Table I

DISPOSAL OF BASE SOLID WASTES

	Amount	
Disposal method	Quantity (tons/mo)	Percentage
AF land	45,234.52	69.74
Non-AF land	16,872.82	26.02
AF incineration	821.62	1.27
Non-AF incineration	390.50	0.60
Recycle	1,345.27	2.07
Hog feed	193.50	0.30

2. FAMILY HOUSING SOLID WASTES

a. Waste Generation

The total family housing solid wastes for the 90 bases that furnished weight data was 21,853.54 tons per month. This is an average contribution of 3.94 pounds per person per day for each family housing occupant. The median contribution is 3.19 pounds per person per day, which is comparable with the 1968 national average of 3.0 pounds per person per day. In fact, the family housing per capita figure is surprisingly low. It was expected that this

figure would be somewhat larger than it is because of the general increase in the per capita refuse production nationwide and their relatively greater access to packaged foods which produce large amounts of packaging material wastes.

The range was from 0.04 pounds per person per day at Kincheloe AFB, Michigan to 18.26 pounds per person per day at Minot AFB, North Dakota. The values are quite removed from either median or average values, and it is felt that this is because of the lack of requirements in recording the weight of wastes generated on a base. Since there is presently no requirement for keeping a record of the weight of refuse generated, the weights had to be estimated or spot-checked. It is conceivable that such methods could produce what might be called erroneous data even though unusual values were verified by telephone.

A frequency distribution graph of the per capita data is presented in figure 3.

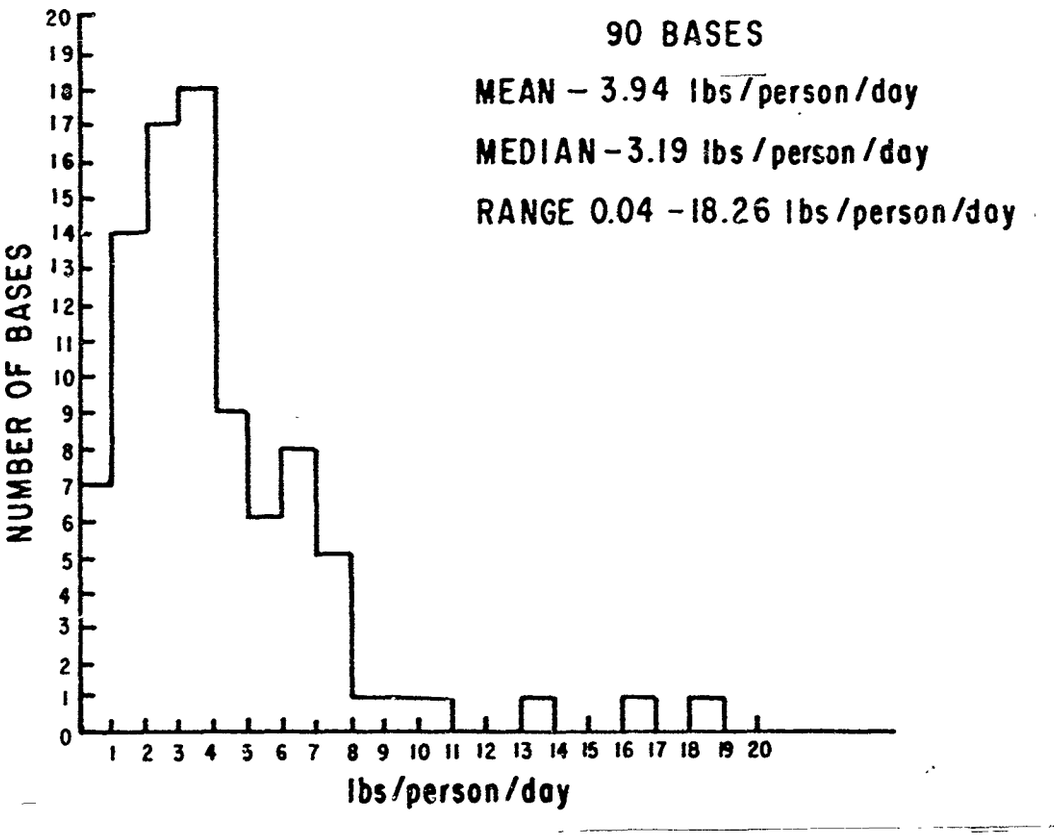

Figure 3. Family Housing Solid Wastes Frequency Diagram for Per Capita Production

b. Storage and Collection

Storage and collection information was reported by all 98 installations. Two bases report storage of family housing wastes exclusively in dumpsters, while 61 use garbage cans exclusively, and the remaining 35 use some combination of storage containers. Four bases store 75 percent or more of their household wastes in dumpsters and 86 store 75 percent or more in garbage cans. Eight bases use a combination of storage containers where neither is 75 percent or more.

The collection of family housing wastes is primarily a contractor operation. Twelve bases report 100 percent of the family housing wastes picked up by Air Force personnel, while 59 use contractor services exclusively, and 27 bases use Air Force and contractor personnel for collection. Air Force personnel pick up 75 percent or more of the wastes from 15 bases, while contractors collect 75 percent or more from 79 family housing areas. Four bases use Air Force and contractor collection where neither collects 75 percent or more. The figure of 75 percent was arbitrarily chosen to show what means are primarily used for storage and collection.

Collection frequency as related to the presence or absence of garbage grinders is summarized in table II.

Table II

COLLECTION FREQUENCY RELATED TO GARBAGE GRINDERS IN FAMILY HOUSING UNITS

Housing units with garbage grinders (percent)	Collection frequency (times/wk)						
	1	2	3	1 & 2	1 & 3	2 & 3	1, 2 & 5
100	6	27	4	1	0	0	0
>50	4	15	2	3	0	1	1
<50	0	3	0	0	0	0	0
0	1	23	2	3	2	0	0
Totals	11	68	8	7	2	1	1

Table II shows that there are 27 bases where all the family housing units have garbage grinders; these provide twice weekly refuse collection. It also shows that there are two bases providing thrice weekly pick-up where the majority of family housing units have garbage grinders.

There are 100,857 family housing units reported by the 98 installations. Of these, 65,197 (64.6 percent) have garbage grinders.

c. Density

All 98 bases submitted information on the volume of solid waste from their family housing units. The total was 6,648,239.5 cubic feet per month. For the 90 bases that submitted weight data, the total volume was 6,292,346.5 cubic feet per month. A frequency diagram for the family housing waste densities is given in figure 4.

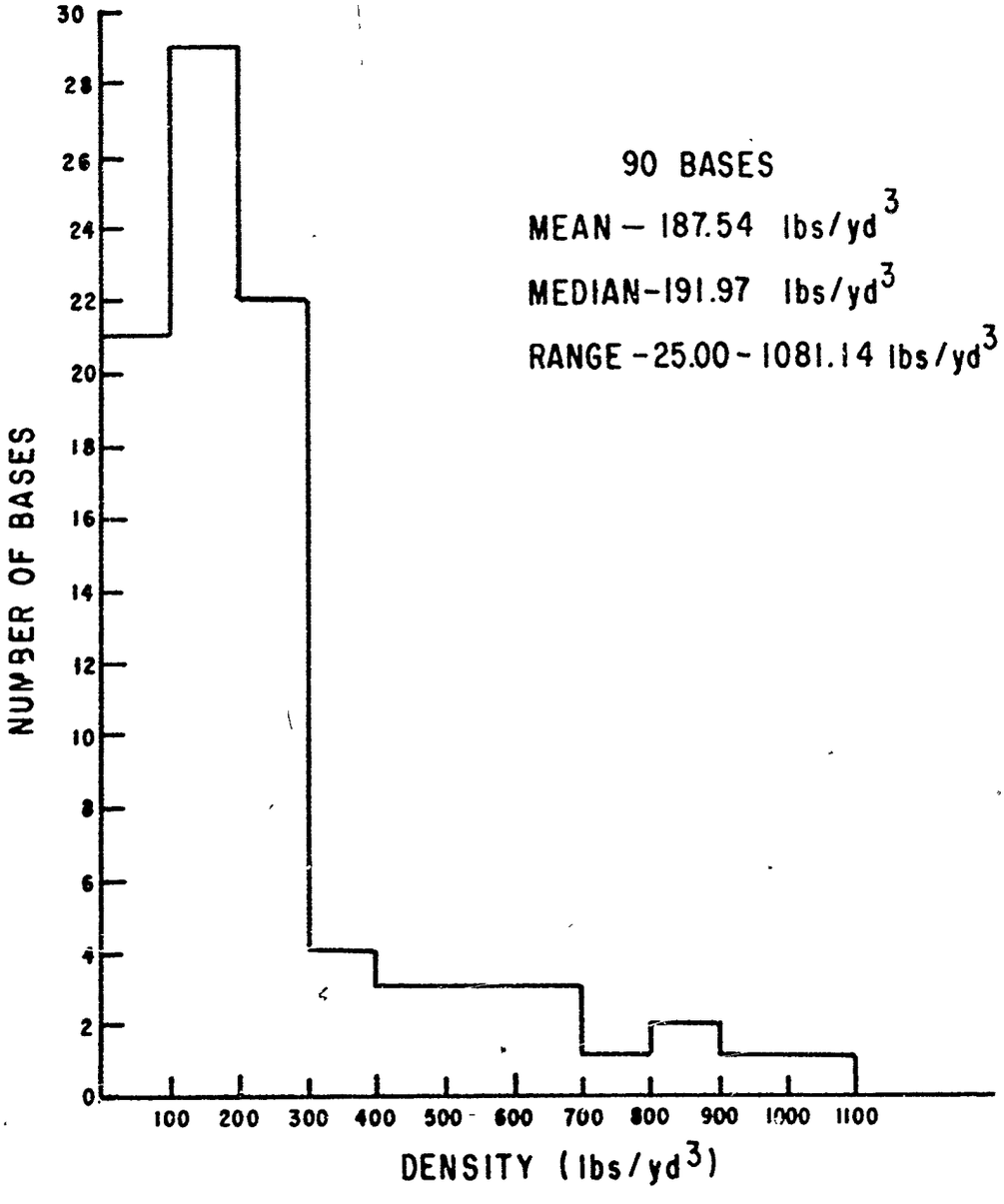

Figure 4. Family Housing Solid Wastes Density Frequency Diagram

The average density was calculated to be 187.54 pounds per cubic yard; the median was found to be 191.97 pounds per cubic yard. The range was from 25.0 pounds per cubic yard at Norton AFB, California, to 1081.14 pounds per cubic yard at Plattsburgh AFB, New York. As explained before, the large range is because of the gross estimates that were necessary at some bases to provide weight data.

d. Disposal

More than 97 percent of the 21.853.54 tons per month of family housing wastes are disposed of by landfill. The disposal method and quantities for each are presented in table III.

Table III

DISPOSAL OF FAMILY HOUSING SOLID WASTES

	Amount	
Disposal method	Quantity (tons/mo)	Percentage
AF land	11,413.72	52.23
Non-AF land	9,796.52	44.83
Civilian incineration	580.60	2.66
Recycle	62.70	0.28

3. GREASE DISPOSAL

Quantitative information from the bases ranges from 1 gallon per month to over 100,000 gallons per month. Many bases reported only so-called "hard" grease, which is material that is separated before its introduction into the sanitary sewer or before its storage. Many reported combined figures for hard grease and pumpings from grease traps which includes large, unknown amounts of water. Fifty-two bases reported that some or all of their grease was collected by a contractor for reclamation. The remaining 46 bases disposed of all their grease in landfills.

4. GARBAGE GRINDERS

The information reported by the 98 bases is summarized in table IV.

Table IV

GARBAGE GRINDERS IN DINING HALLS, CAFETERIAS, AND OPEN MESSES

Function	With garbage grinder	Without garbage grinder	Totals
Dining halls	192	89	281
Cafeterias	175	130	305
Open messes	162	58	220
Totals	529	277	806

5. SOLID WASTES GENERATED IN SEWAGE TREATMENT

Sixty-seven out of 98 installations treat their own sewage. Out of these, 35 dispose of their sludge and grit by means of landfill, 12 use the solids as fertilizer, 15 use a combination of landfill and fertilization, 4 use lagoons, and 1 installation employs an oxidation pond for its sewage treatment. The quantities of sludge and grit disposed of range from 400 pounds per month at Laughlin AFB, Texas, to 1,538,700 pounds per month at McClellan AFB, California. However, no generalization can be made about the amounts since it is unknown whether the quantities reported are on a wet or dry basis. Eight bases listed the quantity of sludge and grit disposed of as unknown. A complete breakdown of the quantities disposed of and the disposal method for each installation may be found in appendix V.

6. PATHOLOGICAL WASTES

The amount of pathological wastes generated at medical treatment facilities range from 0.0 pounds per week for the Class B Dispensary at Vance AFB, Oklahoma, to 22,700 pounds per week for the 125-bed hospital at Vandenberg AFB, California. Four bases out of 98 reported that the quantity of pathological wastes on their base is unknown. The number of beds at the medical facilities range from 0 at 17 different installations to 1000 at Lackland AFB, Texas. For the 77 bases with an in-patient capability, the per capita production of pathological wastes range from 0.04 pounds per bed per week at Goodfellow AFB, Texas, to 181.60 pounds per bed per week at Vandenberg AFB, California. There are 21 bases with either no beds or an unknown amount of pathological wastes from which

such a figure could be calculated. The average for the 77 installations was calculated to be 5.63 pounds per bed per week and the median was found to be 1.21 pounds per bed per week. A frequency distribution curve of the data obtained can be found in figure 5.

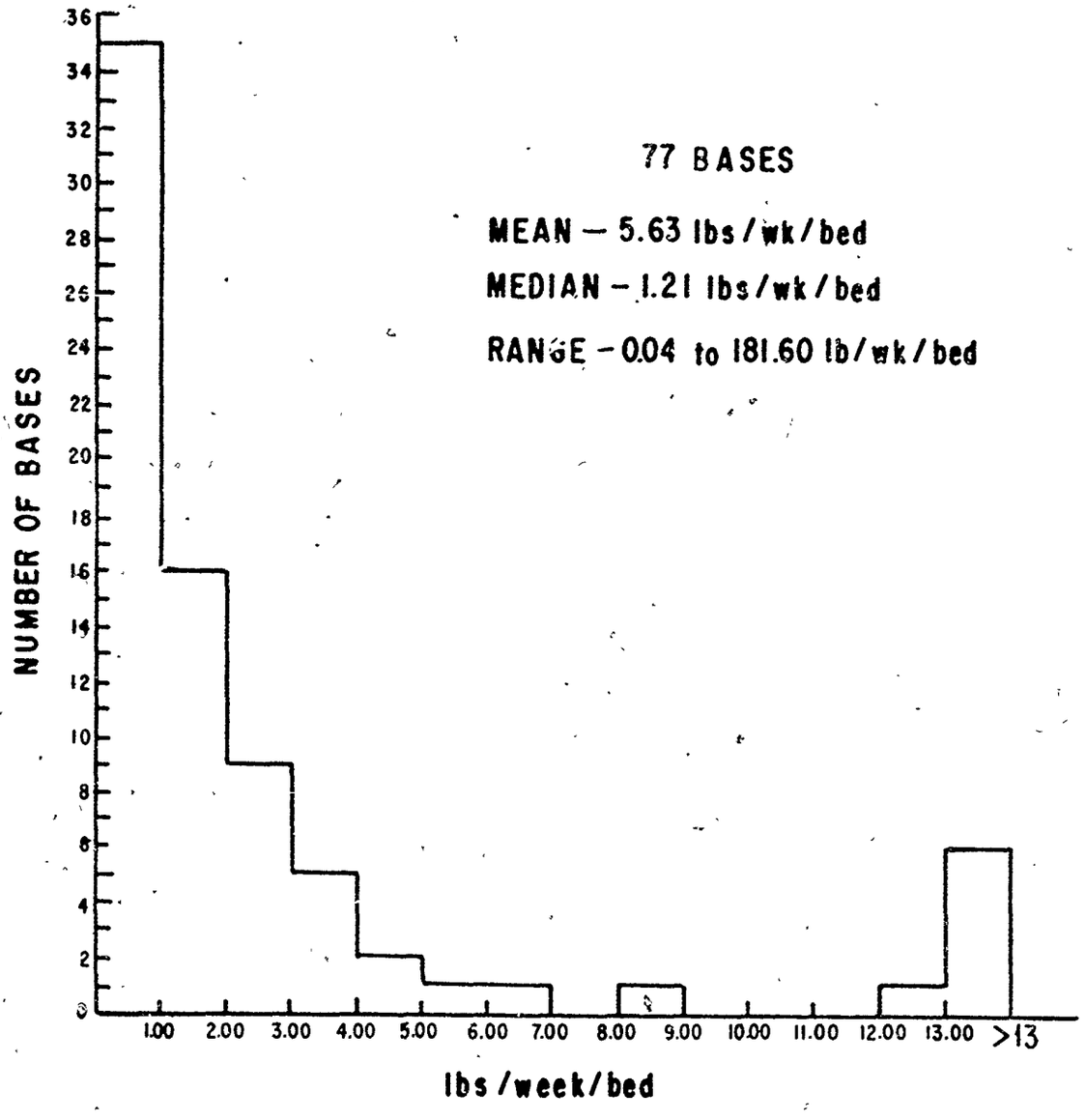

Figure 5. Pathological Wastes Frequency Diagram

To obtain an idea of the composition of the pathological wastes generated at Air Force bases, the questionnaire requested percentages in the following categories: tissue, plastics, bandages, paper, and "other." The percentages obtained in the responses showed no consistency as can be seen from the

tabulations in appendix V. Percent of tissue and percent of plastics each range from 0.0 to 100 percent. Percent of bandages range from 0.0 to 95 percent, percent of paper from 0.0 to 97.62 percent, and percent of other materials from 0.0 to 80 percent. Some of the items listed in the other category include syringes, serum, kitchen wastes, cardboard, drugs, glass, blood, splints, vials, test tubes, petri dishes, cultures, needles, metal, rubber, and cloth.

It should be noted that it is quite difficult to report "typical" data values in this category, since such values are entirely dependent on the type of facility and the types of products it uses. For instance, a Class B Dispensary cannot be expected to have the same types and amounts of wastes as a large hospital. Similarly, a hospital that has a large laboratory facility would have wastes of a different composition than a hospital with a small laboratory. Another point for consideration is that one medical facility may use a large amount of disposable items, whereas another may not. Furthermore, in regard to pounds per bed per week numbers, it should be noted that pathological waste quantities are truly a function of in-patient load and not hospital capacity. Careful interpretation is necessary to prevent the formation of erroneous conclusions.

The majority of the bases dispose of their pathological wastes by incineration and landfill. Out of 97 bases reporting wastes in this category, 66 use incineration only, 13 use landfill only, 16 use a combination of incineration and landfill, and 2 use a combination of incineration, landfill, and sewage disposal. Out of the 31 installations that reported use of landfill alone or in combination with another method, 12 autoclave the wastes going to the landfill, and 14 bases did not indicate autoclaving before landfill disposal. The two bases that employ sewage as a partial disposal means employ garbage grinders to dispose of their placentas.

Out of 77 bases that reported the use of their own incinerators for burning pathological wastes (Brooks AFB, Texas, reported four incinerators), temperature data was supplied for only 32 incinerators. The data were for either primary or secondary chambers or both. In some cases the temperatures were not actual temperatures, but rather information taken from manufacturers' literature.

Approximately 50 percent of the incinerators reported in use are 9 years old or older; three of these are 20 years old and one is 40 years old. Because of their age, many of these incinerators, and possibly some of the more recent

ones, most likely do not meet air pollution control standards. In such cases, it may be necessary to install air pollution control devices to bring down emissions to acceptable levels.

7. CLASSIFIED WASTES

Ninety-five out of 98 bases reported figures for classified wastes totaling 1,638,939.5 pounds per month, with Kelly AFB, Texas, accounting for almost 50 percent of this total (716,000 pounds per month). The lowest reported value came from Moody AFB, Georgia, which reported only 0.5 pounds per month of classified wastes. A complete rundown on the bases and the amount of classified wastes reported by them may be found in appendix VI.

Disposal of classified wastes was broken down into four categories: incineration, grinding, pulping, and "other." Fifty-eight bases use incineration only as a disposal technique. Eight use grinding only, 7 use pulping only, and 25 use a combination of two or more of the three methods. Kelly AFB, Texas, was the only base reporting disposal in the other category. This was burial of 35,800 pounds per month of classified metal wastes. The breakdown on the figure for the way each base disposes of classified wastes may be found in appendix VI.

Incineration is used at 70 bases, either alone or along with another method of disposal. A total of 82 incinerators were tabulated, four bases having more than one incinerator. Of the 82 incinerators, about half were reported as being 9 years old or older; five of these were reported as being 20 years or older. As noted for the incinerators used in burning pathological wastes, there is an indication here that many incinerators used for burning classified materials do not meet the standards for air pollution control. It was found that only 14 bases employ some sort of air pollution device for their classified waste incinerators.

Six Air Force bases (Griffiss AFB, New York; Kincheloe AFB, Michigan; Moody AFB, Georgia; Mountain Home AFB, Idaho; Otis AFB, Massachusetts; and Seymour-Johnson AFB, North Carolina) (60 percent) incinerate their classified waste in boilers. In small quantities, such a practice does not appear to be harmful and seems to be one means of capturing the heat value of the waste.

8. LIQUID INDUSTRIAL WASTES AND FIRE FIGHTING TRAINING

The information on liquid industrial waste disposal and fire fighting training was included in the questionnaire at the request of the Air Force

Surgeon General's Office. The data submitted are tabulated in appendix VII. Engine oil was reported as a separate item by 86 bases with a monthly quantity of 115,301 gallons. Eighty-two bases dispose of 12,209 gallons per month of hydraulic fluid. Disposal of industrial fluids such as cutting oils, cleaners, strippers, and other petrochemical wastes not elsewhere reported amount to 148,736 gallons per month from 87 bases. There are 241,859 gallons per month of contaminated fuel disposed of by 91 bases. Of the 97 bases who reported emergency destruction of fuel as a separate item, 12 disposed of 108,480 gallons during FY 1970; the rest reported no emergency destruction of fuel during that period.

A total of 11 bases included one or more of the other categories of liquid industrial wastes in the engine oil category. These figures are not included in the above totals and are considered as a separate item. The quantity of such combined liquid industrial waste is 93,889 gallons per month.

All 98 bases provided information on fire fighting training, which is included in appendix VII. Only two bases, the Aeronautical Chart and Information Center, St Louis, Missouri, and Gunter AFB, Alabama, do not conduct regular training sessions involving real fires. The 96 bases that do have such drills conduct 1,149.5 fires per quarter, using a total of 594,685 gallons of fuel. JP-4 and other aircraft propellants are the fuels of choice for nearly all the bases.

The number of fires per base ranges from 2 per year at Brooks AFB, Texas, to 200 at Cannon AFB, New Mexico, and the fuel per drill ranges from 5 to 3000 gallons.

All 96 bases indicate that they make an effort to perform the training under favorable meteorological conditions, i.e., maximum dispersion, winds in the direction of unoccupied areas, etc.

9. PESTICIDES AND HERBICIDES

A list of the pesticides and herbicides now in storage awaiting disposal instruction is in appendix VIII. These wastes are in the solid, liquid, and gaseous forms, and they present an immediate problem since there are no firm methods accepted at the present time for their storage and disposal. It is difficult to analyze the data in this category since the wastes reported are in various physical states and forms and are given in different unit amounts.

10. ON-BASE LANDFILL OPERATIONS

Eighty-one of the 98 bases operate a land disposal facility on the base. The trench type of landfill is being used by 67 bases with the other 14 using the area method.

The estimated life of these landfills ranges from 1/6 of a year at McChord AFB, Washington, to an unlimited life at Edwards AFB, California. Of the 81 bases with landfills, 40 have fills with a life of less than 10 years while 41 have a life of 10 or more years. The life of the landfills was calculated on the basis of 15 acre feet per 10,000 people per year.

In regard to operation of the fill, the number of operators used per fill operation ranges from 0.2 to 11.0 per 8-hour day. The fractional number indicates a person that is on duty for only part of the working day. The average of 1.5, however, gives a better indication of the number of operators used at each base. There are 75 bases with two or less operators per 8-hour day, and of these 75 there are 54 bases with less than two operators per working day.

The most frequently used piece of equipment in the landfill operations is the D-6 bulldozer tractor. The number of vehicles available at a particular base ranges from one to four. Thirty-seven bases have one piece of equipment of any type, 29 have two pieces, 12 have three pieces, and 3 have four pieces of equipment. It should be noted that in many cases certain equipment is available at the landfill for only part of the full day's operation.

11. SEDIMENTATION FROM EROSION

Eighty-eight bases indicated slight land erodability, eight indicated moderate, and two indicated severe. This data for individual installations along with erosion control practices and land area currently denuded may be found in appendix IX.

SECTION III

DISCUSSION OF RESEARCH NEEDS

1. STORAGE AND COLLECTION OF BASE AND FAMILY HOUSING WASTES

At the present time, family housing wastes are stored mostly in garbage cans and are collected by contract personnel. Base wastes, on the other hand, are mostly stored in dumpsters and collected by Air Force personnel. It appears from the data presented that a minimum of planning has been done in both areas. Considering the fact that approximately 80 percent of the expenditures for solid waste management is for collection and transportation (Ref. 1), it appears that some research and cost analysis should be done on this particular aspect of solid waste management in order to optimize the collection systems and minimize costs.

Several studies in civilian communities have shown considerable savings in collection costs resulting from switching from backyard pick-up of garbage cans to curbside pick-up in either plastic or paper sacks. With the use of the sacks, collection frequency can normally be reduced to once per week without sacrifice of sanitation or esthetics and without fly-breeding problems. Sacks can be tightly closed and do not require cleaning as do cans to remove spilled garbage and other fly attractants.

Collection efficiency in terms of manhours expended per ton of refuse collected have increased as much as 20 percent by the change in collection system proposed above.

Home-type compactor units are now available which allow a reduction of household refuse to approximately one-fourth of its original volume or, to put it another way, one large paper sack may be filled to an equivalent of what is contained in about two 30-gallon refuse cans.

The Solid Wastes Management Office is sponsoring several demonstration programs which are beginning to show promise in this area. For instance, in Scottsdale, Arizona, it has been shown that refuse from a residential area can be collected mechanically, i.e., without a man touching the containers or leaving the cab of the collection vehicle. Special containers of 80-gallon capacity are provided to each family. On alley routes a 300-gallon container

can serve four families. A unique loading device permits the truck operator to pick up the special containers, empty them into a large packer body, and return the container without leaving the cab (Ref. 4). Considerable savings in cost have been observed.

In Chilton County, Alabama, rural residents are placing their refuse in 4-cubic-yard containers located along collection routes. This eliminates collection from individual households in the rural districts.

The Air Force should conduct a systems analysis to determine the optimum scheme or schemes that should be incorporated into its waste storage and collection systems. Questions that should be answered include: Should paper or plastic sacks be provided? Should household compactors be used? Should residents carry their refuse to a centrally located container to be shared by a number of households? Should base and family housing waste be considered separately or as one in solid waste planning?

Serious consideration should be given to integrating collection and storage systems for family housing and base wastes. Presently, there appears to be a haphazard connection, if any. If at all feasible, refuse collection, processing, and disposal should be performed by contractor personnel. In this case, a certain amount of expertise should be developed and maintained within the Air Force establishment to enable monitoring of the contractor operation.

With the emphasis being placed on solving solid waste problems, it is no longer adequate to report refuse quantities by volume. Weight measurements are now the basis of determining the extent of the solid waste problem in civilian communities, and the Air Force should follow suit. Such measurements need not be accomplished for every load of refuse, but once a baseline has been established, periodic spot-checks, possibly monthly, should suffice. Small, transportable scales are available for weighing of trucks through measurements taken at each wheel. Thus, large, permanent, and expensive whole truck platform weighing stations need not be constructed.

2. DISPOSAL OF BASE AND FAMILY HOUSING SOLID WASTES

As the amount of solid wastes continues to grow, it becomes more and more important to consider in what way the Air Force will dispose of its wastes. Table I of this report shows that 69.74 percent of base solid wastes are presently disposed of on Air Force land and 26.02 percent are disposed of on non-Air Force land. Similarly, as shown in table III, 52.23 percent of family

housing solid wastes are disposed of on Air Force land and 44.83 percent are disposed of on non-Air Force land. This shows that up until now, landfill has been chosen above other means as the prime disposal method for Air Force solid wastes. How much longer will the Air Force be able to employ landfill? According to the results of the questionnaire, of the 81 Air Force installations that have landfills of their own, approximately 50 percent had fills with a life of less than 10 years. This means that within 10 years or sooner, these installations will have to look elsewhere to dispose of their solid wastes. The immediate answer would appear to be the use of civilian landfill areas. However, it must be emphasized that the civilian population is growing and associated with this is the even more rapid increase in per capita production of refuse.

The first step, of course, is to maximize the use of present landfills. Open dumping and burning must be prohibited. All land disposal sites should be converted to sanitary landfills. This means that the refuse is compacted daily and overlayed with 6 inches of cover material. The final cover should be a minimum of 2 feet of clean dirt.

However, proper operation of a landfill will not prolong the life of the fill indefinitely. The Air Force should investigate volume reduction methods such as incineration, pyrolysis, and recycle to further extend the life of landfill areas as a disposal means.

The latest incineration technology has brought new designs and concepts such as high-temperature, starved-air, and fluidized-bed incineration (Ref. 5). Concepts such as the incineration of refuse and sewage sludge together, the heat of the burning refuse being sufficient to also incinerate the sludge, are coming into view. Incineration may also be a means to convert the energy contained in refuse to electricity.

In pyrolysis, refuse is heated to high temperatures in the absence of oxygen. Valuable gaseous, liquid, and solid products may be recovered from this process. The Air Force should investigate applications to determine if any of these methods are feasible for its use.

Another consideration in the area of disposal is not to dispose of the refuse at all. Although total recycling is something in the future, efforts must be started now to achieve success. This is especially true in the base solid waste area. For instance, the commissary and base exchange facilities are likely places to begin paper and cardboard recycling efforts since there

are large quantities of such wastes generated at these facilities, and they are relatively easily segregated from other wastes. Recycling efforts such as this, along with other disposal means should be included in an optimization study of the type mentioned under the discussion dealing with storage and collection. Recycling efforts may prove to be minimal at the present time, but they will not be so in the future. Emphasis on recycling was put in the Resources Recovery Act of 1970 (Ref. 2). Furthermore, it is of utmost importance that present considerations in the areas of collection, processing, and disposal in general be geared to future improvements. With technology rapidly introducing new techniques, it is no longer economically safe to design a system that will be satisfactory in the present but obsolete in the future. Careful research must be accomplished so that systems employed by the Air Force are designed in such a way that they may be expanded and improved as new and better technology is developed.

The inclusion of Air Force installations into regional planning efforts for solid waste management along with civilian communities should be researched. Establishing processing and disposal sites to handle the solid wastes from a region rather than individual communities has many advantages. With the availability of landfill rapidly decreasing, the cost of disposal will rapidly go up. This will be because of the increase in the cost of available land. Another reason for increased disposal costs is the higher costs of advanced technology for solid waste disposal. The larger volumes of wastes handled regionally usually reduce unit costs for both processing and disposal. It also allows expenditure of sufficient money to provide adequate environmental protective systems and devices. In accordance with PL 91-512 (Ref. 2), regional planning is the preferred approach to future solid waste management efforts.

Along these same lines, it should be determined how small Air Force installations near a large Air Force base should be included in this total picture. Large installations may have to act as a central processing site optimizing management of wastes generated by small installations.

3. PATHOLOGICAL WASTES

The questionnaire showed that approximately 50 percent of the incinerators used to burn pathological wastes were 9 years old or older. The oldest is 40 years old. It is doubtful if all or even most of these incinerators can handle present-day wastes. To alleviate some of the problems, more care should be taken in segregating actual pathological wastes from non-pathological wastes

before disposal. This will reduce the number and volume of wastes that must be fed into the pathological incinerator.

Modification or replacement of some pathological incinerators, especially the older ones, may be necessary because they were designed to incinerate wastes of lower heat content than is usually present in today's hospital wastes. The increase is because of the greater use of disposable plastic and paper items. This results in much higher temperatures and may easily damage incinerators designed to burn wastes of lower heat content. To determine which incinerators do not meet air pollution standards, the Environmental Health Laboratories should survey all pathological incinerators for compliance with air pollution legislation. A program for updating and standardizing a family of pathological waste destructor units should be developed for Air Force use.

It is possible that the present concept of entirely segregating pathological wastes from other refuse may prove to be obsolete in the future. This is especially true if incineration and pyrolysis are considered as the future means of disposing of Air Force solid wastes. It will be necessary in such a case to consider integrating the disposal of pathological wastes with other refuse.

4. HERBICIDES, PESTICIDES, AND PETROCHEMICAL WASTES

At the present time there is much controversy concerning the storage and disposal of herbicides, pesticides, and petrochemical wastes. It appears that these wastes have much potential for recycle in the form of material or heat recovery. Material recovery may especially be pertinent to petrochemical wastes which might be refined again to usable substances.

Research should be accomplished on the disposal of these wastes by means of the latest incineration techniques or by pyrolysis with possible recovery of valuable substances and energy. The possibility of regional disposal should be included in the economic analysis of such a study.

During FY 1972 the Environmental Protection Agency (EPA) will conduct a survey of hazardous solid wastes found on federal facilities. The objective of the survey is to determine types, amounts, and locations of these hazardous wastes for the purpose of establishing central disposal sites. It is recommended that the pesticides and herbicides now in storage remain at their present locations unless they present uncontrollable leakage, decomposition to more dangerous products, etc. As an interim measure such wastes should be carefully

repacked into containers that would eliminate any danger to people and property. When hazardous waste disposal sites are established, all these wastes can then be shipped there for processing and final disposal.

5. CLASSIFIED WASTES

Classified materials consist of paper, photographic film, or metal. Of the three mentioned here, photographic film has the greatest potential for recycling because of its silver content.

Presently, the Navy is responsible for silver recovery programs throughout DOD. Active research is being conducted in developing chemical means for removing the silver from film, leaving the film base polymer for possible recycle. The Navy is also conducting an optimization study for the most economic placement of film-destruction/silver-recovery units, in particular, film destruction incinerators. The Air Force should closely monitor developments in these studies. Since most of the Navy's efforts are being conducted on a large scale basis, it would be profitable for the Air Force to investigate small-scale film-destruction/silver-recovery units that might be used on installations disposing of small amounts of film. Such systems may easily be integrated and prove to be profitable in an optimization scheme.

6. GENERALIZED STUDY

An in-depth study of the solid waste management at several bases should be performed. The bases should be selected to provide the maximum variation in terms of mission, geography, climate, etc., so that the results of the study will have the widest potential applicability to other bases. The study should be aimed at achieving an overall mass balance of solids entering and leaving the base. The objective of the effort should be to determine qualitatively and quantitatively all the sources of solid wastes on these bases, characterize these wastes in terms of quantity and composition, determine areas where the potential exists for economical resource recovery from discarded materials, identify changes in processing and disposal techniques to reduce expenditures in those areas, identify changes in processing and disposal techniques to eliminate or at least keep to an absolute minimum any environmentally detrimental effects, and recommend methods for reducing the quantities of wastes generated at the various sources.

SECTION IV

RECOMMENDATIONS

The following recommendations are submitted:

1. A study should be done to optimize storage and collection systems with respect to costs. The study should include use of paper or plastic sacks, home-type compactors, centralized refuse containers, the latest collection techniques, etc.

2. Refuse quantities should be reported by weight to give a more accurate accounting of the actual amount of refuse produced.

3. All landfill areas on Air Force installations should be converted to sanitary landfills. This means that the refuse is compacted daily and overlayed with 6 inches of cover material, the final cover being a minimum of 2 feet of clean dirt.

4. The Air Force should investigate volume reduction methods such as incineration, pyrolysis, and recycle to extend the life of landfill areas as disposal means. All the latest technological developments and concepts must be considered.

5. The inclusion of Air Force installations into regional planning efforts should be researched. This is to include how small installations are to fit in the total solid waste management effort.

6. To alleviate some of the problems of incinerating pathological wastes, more care should be taken in segregating actual pathological wastes from non-pathological wastes before incineration. The Environmental Health Laboratories should survey all pathological incinerators for compliance with air pollution legislation so that proper action may be taken where needed.

7. If incineration and pyrolysis are considered as future means of disposing of Air Force wastes, the integration of pathological wastes with other refuse should be studied.

8. Incineration and pyrolysis techniques should be investigated for the disposal of herbicides, pesticides, and petrochemicals with consideration given to material and energy recovery and regionalized disposal.

9. Herbicides and pesticides now in storage that present an immediate danger should be carefully repacked into suitable containers to safeguard people and property from hazards. Various methods should be researched to determine the best handling and disposal means including those mentioned above.

10. The Air Force should closely monitor the Navy's efforts in film destruction and silver recovery. It would be profitable for the Air Force to investigate small-scale units to be used on installations disposing of small amounts of film.

11. An in-depth study of the solid waste management at several bases should be performed. The study should be aimed at achieving a mass balance of solids entering and leaving a base with the ultimate purpose of developing emission factors and determining the most economic solid waste processing and disposal techniques.

APPENDIX I

AIR FORCE WASTE PRACTICES QUESTIONNAIRE

A. Installations Information

1. Name of Installation _____

   a. Major Host Command _____
   b. Station Location Code _____
   c. General Services Administration(GSA) Number _____

2. County _____

3. State _____

4. Nearest City _____

5. Name, Grade, and Job Title of Individual Completing Questionnaire

   _____

   a. Complete duty phone number _____
   b. Complete duty mailing address _____

6. Installation Population

   a. Equivalent population _____ (per AFM 88-11)
   b. Number of people residing in family housing _____

B. Solid Waste Handling -- Divided Into Two Groups:

   Group A Base
   Group B Family Housing

1. Where is waste stored prior to pick-up?	Group A	Group B
a. Dumpster	____%	____%
b. Garbage cans	____%	____%
c. Other (specify)	____%	____%
	____	____

2. Waste collected by	Group A	Group B
a. AF Personnel	____%	____%
b Contract Personnel	____%	____%
c. Other (specify)	____%	____%
	____	____

3. Frequency of pick-up _____ times/week

4. Waste disposed by	Group A	Group B
a. Incineration	____%	____%
b. Sanitary land fill	____%	____%

c. Open dump	_____%	_____%
d. Open burning	_____%	_____%
e. Other (specify)	_____%	_____%

5. Where is the disposal facility:	Group A	Group B
a. On AF property	_____%	_____%
b. On civilian property	_____%	_____%
c. On other Government property	_____%	_____%

6. Total quantity disposed	Group A	Group B
tons per month	_____	_____
cu ft per month	_____	_____

7. Indicate how the figures for total quantity disposed were arrived at:

_____actual weighing; _____periodic survey;
_____estimate; _____other (specify)_____

C. Grease Disposal From Dining Halls, Cafeterias, and Open Messes.

1. Grease storage prior to pick-up

a. Garbage cans _____%
b. Other (specify _____% _____

_____

2. Are cans stored in refrigerator location? Yes_____ No_____

3. Grease collected by

a. AF Personnel _____%
b. Contract Personnel _____%
c. Other (specify) _____% _____

_____

4. Frequency and amount of grease pick-up_____per week.

5. Ultimate disposition of grease_____
_____

D. Garbage Grinders

1. Number

a. Dining halls with_____, without_____
b. Cafeterias with_____, without_____
c. Open messes with_____, without_____
d. Family housing units with_____, without_____

E. Solid Wastes Generated in Sewage Treatment

1. How are sludge, grit, etc., ultimately disposed? _____

2. If disposed by contract, what is the ultimate disposition? _____

3. How much is disposed? _____ lbs per month

F. Pathological Wastes

1. Size of your medical facility _____ (number of beds)

2. If pathological wastes are disposed of by incineration:

   a. Is incinerator designed specifically for pathological wastes? (Type 4, 80-85% moisture) _____
   b. Rated size of incinerator _____ lbs/hr of Type 4 wastes
   c. Average amount burned _____ lbs/wk, _____ cu ft/wk. (please give both figures.)
   d. Is incinerator preheated prior to charging? Yes_____ No_____
   e. How is residue, ash, etc., disposed of? _____
   f. Has any stack sampling been performed? Yes_____ No_____
   g. If so, when, by whom, what analyses (particulate, gaseous, microbiological) were run, and what were the results?
   h. Age of incinerator _____ (years)
   i. Type of air polution control equipment _____
   j. Is there a secondary combustion chamber? _____
   k. Is this incinerator used for other types of wastes? Yes____ No____
   l. If so, what type and how much? _____
   m. Are there any temperature measurement devices in either or both chambers? _____
   n. What temperatures are maintained? _____°F, primary chamber, _____°F, secondary chamber

3. If pathological wastes are disposed of by means other than incineration, please elaborate _____

4. If pathological wastes are sorted prior to disposal, i.e., plastics to land fill, tissue to incinerator, etc., please elaborate _____

5. What is composition of your pathological wastes?
_____% tissue, _____% plastics, _____% bandages,
_____% paper, _____% other (specify)_____

6. How did you arrive at composition figures? _____

G. Classified Wastes

1. How are classified wastes disposed of? (If more than one is applicable, indicate percent for each.)

   a. Incineration_____%
   b. Grinding_____%
   c. Pulping_____%
   d. Other (specify)_____

2. If incinerated:

   a. Is it a multiple- or single-chamber incinerator? _____
   b. Rated capacity of incinerator (lbs/24 hrs)_____
   c. Average amount burned (lbs/24 hrs)_____
   d. Average operating time (hrs/day and days/week)_____
   e. Number of operating personnel per shift_____
   f. Age of incinerator (yrs)_____
   g. Has any stack sampling been performed? Yes_____ No_____
   h. When?_____
   i. Who performed it (Organization) _____
   j. What were the results, and does the incinerator meet Federal/State criteria? _____
   k. How are ashes disposed of? _____
   l. Type of air pollution control equipment installed (if any)

3. If grinding or pulping, what is ultimate disposal? _____

4. Monthly quantity disposed of (lbs)_____

H. Liquid Industrial Wastes:

1. Volume of waste engine oil generated per month_____gallons.

   a. How is it disposed of? _____

   b. If by contract, how often and the cost? _____

   c. If by fire department, how often do they burn? _____

2. Volume of waste hydraulic fluid generated per month_____gallons:

   a. How is it disposed of? _____

   b. If by contract, how often and the cost? _____

   c. If by fire department, how often do they burn? _____

3. Volume of industrial wastes (cutting oils, cleaners, strippers, and other petrochemical wastes not included in other answers) generated per month_____gallons.

   a. How is it disposed of? _____

   b. If by contract, how often and the cost? _____

   c. If by fire department, how often do they burn? _____

4. Volume of contaminated or out of spec fuel generated per month_____ gallons.

   a. How is it disposed of? _____

   b. If by contract, how often and cost? _____

   c. If by fire department, how often do they burn? _____

5. Emergency destruction of fuel

   a. How often during FY 1970? _____
   b. Method(s) of disposal_____

   c. Total volume_____gallons
   d. Material and contaminant involved_____

6. Fire fighting training of open fires

   a. Frequency for maintaining proficiency_____

   b. Frequency for training recruits_____

   c. Source and volume of combustibles_____

   d. Are efforts made to perform training under favorable meteorological conditions; i.e., maximum dispersion, winds in direction of unoccupied areas, etc.? Yes_____ No_____

I. Pesticide and Herbicide Disposal

1. How are waste pesticides/herbicides disposed of? _____

2. What types, quantities, and by what method did you dispose of any pesticides/herbicides during FY 1970? _____

3. What types and quantities of herbicides/pesticides are stored pending disposal instructions? _____

J. Other

1. What effect does disposal have on the environment; i.e., smoke, odors, etc., from incineration or open burning; vector breeding, bird attraction, blowing paper, etc., from land fill; water pollution, i.e., by improper disposal of residue quench water from an incinerator or leaching from a land fill? _____

2. Sanitary Land Fill

   a. Is base solid waste disposed of in sanitary land fill? Yes_____ No_____

   If yes, answer b through g.

b. Operations for fill_____number of people
_____hours per day

c. Type of equipment available and amount of time available at site.

_____
_____
_____
_____
_____

d. Is refuse covered daily (6 inches of cover)? Yes_____
No_____

If not, how often is it covered? _____

e. Type of land fill: _____trench
_____area

f. Estimated life of present fill area_____years (based on 15-acre feet/10,000 people/yr.

g. Is completed fill covered with minimum of 2 feet of compacted earth?

Yes_____
No_____

3. Sedimentation From Erosion

a. Rate erodibility of base land subject to current and/or future construction

_____Severe,_____Moderate,_____Slight

b. What erosion control practices are used on sites during construction?

_____
_____
_____
_____
_____

c. Estimate area currently denuded by grading without temporary cover du to contruction activities.

_____acres

K. Additional Comments (attach additional sheets as required).

APPENDIX II

BASE SOLID WASTES

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo) Land AF	Land Non-AF	Other
Air Force Academy, CO	Unknown	Unknown	Unknown	(100%)		
Aeronautical Chart and Information Center, St Louis, MO	70.8	1.29	74.98		70.8	
Altus AFB, OK	207.0	1.03	120.59		207.0	
Andrews AFB, Wash, DC	914.0	7.17	238.43		914.0	
Barksdale AFB, LA	451.0	3.28	135.03	451.0		
Beale AFB, CA	1396.0	8.00	263.32	1396.0		
Bergstrom AFB, TX	190.0	1.77	42.22	190.0		
Blytheville AFB, AR	750.0	9.41	246.71	600.0	150.0	
Bolling AFB, Wash, DC	758.0	8.43	201.94		379.0	379 I-C
Brooks AFB, TX	224.5	4.29	200.00	168.0	56.5	
Cannon AFB, NM	160	1.26	157.09	160.0		
Carsweli AFB, TX	890.0	12.11	356.00	890.0		
Castle AFB, CA	80.5	0.82	26.83	80.5		
Chanute AFB, IL	480.0	2.77	82.57	480.0		
Charleston AFB, SC	1000.0	6.16	125.00	1000.0		
Columbus AFB, MS	Unknown	Unknown	Unknown	(100%)		
Craig AFB, AL	Unknown	Unknown	Unknown	(100%)		
Davis-Monthan AFB, AZ	1216.0	2.91	269.95	1216.0		

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo) Land AF	Land Non-AF	Other
Dover AFB, DE	4050.0	27.01	810.0		4050.0	
Dyess AFB, TX	90.0	1.12	35.29	76.5		13.5 R
Edwards AFB, CA	125.5	0.75	748.59	125.5		
Eglin Aux Fld No. 9, FL	945.0	16.08	270.00	945.0		
Eglin AFB, FL	800.0	4.14	132.92	800.0		
Ellsworth AFB, SD	648.0	4.22	324.00	648.0		
England AFB, LA	1050.0	12.21	240.25		1050.0	
Ent AFB, CO	1473.0	19.04	208.44	1450.0	23.0	
Fairchild AFB, WA	1736.1	21.57	148.14	1728.1		8 I-AF
Forbes, KS	875.0	8.91	810.19	875.0		
F. E. Warren AFB, WY	325.0	3.22	121.95	325.0		
George AFB, CA	230.0	2.01	76.67	230.0		
Goodfellow AFB, TX	194.0	3.41	272.10	192.06		1.94 S
Grand Forks AFB, ND	660.0	3.81	538.78	660.0		
Griffiss AFB, NY	989.4	8.91	270.00	989.4		
Grissom AFB, IN	714.42	8.12	202.50		714.42	
Gunter AFB, AL	205.0	9.62	170.83		205.0	
Hamilton AFB, CA	300.0	2.57	163.93		300.0	
Hill AFB, UT	568.0	3.51	64.78	378.0	99.0	91 R
Holloman AFB, NM	232.0	1.35	201.09	229.68		2.32 I-AF
Homestead AFB, FL	535.0	2.55	299.10		535.0	
Keesler AFB, MS	2847.0	8.68	230.00	34.2	2812.8	
Kelly AFB, TX	940.0	1.89	34.03	42.3	676.0	4.7 I-AF 217 R

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo) Land AF	Land Non-AF	Other
Kincheloe AFB, MI	15.0	0.14	202.50	15.0		
Kingsley AFB, OR	170.0	5.51	222.17		161.5	8.5 I-C
Kirtland AFB, NM	375.0	5.27	100.00		375.0	
K. I. Sawyer AFB, MI	700.0	5.45	248.41	700.0		
Lackland AFB, TX	Unknown	Unknown	Unknown	(90%)	(10%)	
Langley AFB, VA	350.0	2.45	270.00	343.0		7 I-AF
Laredo AFB, TX	Unknown	Unknown	Unknown	(100%)		
Laughlin AFB, TX	270.0	4.32	675.00		243.0	27 H
L. G. Hanscom Fld, MA	570.0	6.11	270.00	550.0		20 I-AF
Little Rock AFB, AR	80.0	0.59	23.98	4.0	76.0	
Lockbourne AFB, OH	365.0	3.53	48.67	365.0		
Loring AFB, ME	888.0	5.15	204.92	888.0		
Lowry AFB, CO	332.0	1.93	619.92		328.7	3.3 R
Luke AFB, AZ	244.0	2.14	70.01		244.0	
MacDill AFB, FL	420.0	2.61	83.92	420.0		
Malmstrom AFB, MT	200.0	1.31	275.09	198.0		2 H
March AFB, CA	90.0	0.80	39.51	87.0		3 I-C
Mather AFB, CA	945.0	8.08	189.00	945.0		
Maxwell AFB, AL	516.6	3.84	165.45		516.16	
McChord AFB, WA	1397.0	6.83	179.19	1397.0		
McClellan AFB, CA	1939.0	5.62	54.54	194.0		775 I-AF 970 R
McConnell AFB, KS	231.0	3.80	250.00		213.0	
McCoy AFB, FL	3470.2	37.82	1505.54	3470.2		

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo) Land AF	Land Non-AF	Other
McGuire AFB, NJ	972.0	3.53	324.00	972.0		
Minot AFB, ND	660.0	2.92	377.14	594.0	64.5	1.5 H
Moody AFB, GA	68.0	1.44	188.31	67.0		1.0 H
Mountain Home AFB, ID	160.0	1.24	144.00	160		
Myrtle Beach AFB, SC	520.2	5.23	159.99	520.0		0.2 I-AF
Nellis AFB, NV	613.5	4.20	126.76	613.5		
Norton AFB, CA	204.46	1.18	25.56	199.58		0.40 I-AF 4.48 R
Offutt AFB, NE	500.0	2.71	101.24	500.0		
Otis AFB, MA	220.0	4.94	209.52	220.0		
Patrick AFB, FL	1255.0	9.43	216.52	1255.0		
Pease AFB, NH	335.0	3.87	606.88	335		
Perrin AFB, TX	Unknown	Unknown	Unknown		(100%)	
Plattsburgh AFB, NY	159.0	1.16	1079.19	159.0		
Pope AFB, NC	249.0	3.84	99.72		249.0	
Randolph AFB, TX	301.05	2.68	270.85		286.00	15.05 R
Reese AFB, TX	1296.0	24.01	869.51	1296.0		
Richards-Gebaur AFB, MO	213.0	1.53	88.34		213.0	
Robins AFB, GA	437.0	1.07	133.27	437.0		
Scott AFB, IL	252.0	1.49	250.00	252.0		
Selfridge AFB, MI	228.0	2.42	120.71	228.0		
Seymour-Johnson AFB, NC	241.0	1.89	180.75	241.0		
Shaw AFB, SC	370.0	1.37	83.25	333.0		37 H

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo) Land AF	Land Non-AF	Other
Sheppard AFB, TX	740.0	3.32	328.89	586.0		29 R 25 H
Tinker AFB, OK	1206.0	8.35	60.00		1206.0	
Travis AFB, CA	Unknown	Unknown	Unknown	(100%)		
Tyndall AFB, FL	3613.0	28.73	807.37	3613.0		
Vance AFB, OK	70.0	2.09	189.19		70.0	
Vandenberg AFB, CA	4840.0	18.61	450.23	4840.0		
Webb AFB, TX	70.0	1.56	54.00	66.0		4 I-AF
Westover AEB, MA	634.0	4.41	80.98	634.0		
Whiteman AFB, MO	300.0	2.98	212.01		300.0	
Williams AFB, AZ	90.0	1.46	36.00	90.0		
Wright-Patterson AFB, OH	1153.0	3.19	89.50	1153.0		
Wurtsmith AFB, MI	Unknown	Unknown	Unknown	(100%)		

Abbreviations used for disposal:

C-Non-Air Force
AF-Air Force
I-Incineration
R-Recycle
H-Hog feed

APPENDIX III

FAMILY HOUSING SOLID WASTES

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo) AF	Land Non-AF	Other
Air Force Academy, CO	Unknown	Unknown	Unknown	(100%)		
Aeronautical Chart and Information Center, St Louis, MO	1.98	6.60	203.08		1.98	
Altus AFB, OK	72.00	2.31	104.73		72.00	
Andrews AFB, Wash, DC	588.00	9.07	560.00		588.00	
Barksdale AFB, LA	292.00	6.08	269.57	292.00		
Beale AFB, CA	590.00	4.65	269.77	590.00		
Bergstrom AFB, TX	110.00	3.49	42.02	110.00		
Blytheville AFB, AR	190.00	3.12	250.06	190.00		
Bolling AFB, Wash, DC	82.00	3.15	62.72		41.00	41 I-C
Brooks AFB, TX	94.50	5.31	200.00	59.50	35.00	
Cannon AFB, NM	48.00	0.85	162.00		48.00	
Carswell AFB, TX	730.00	13.91	358.36		730.00	
Castle AFB, CA	44.50	1.26	161.82		44.50	
Chanute AFB, IL	34.32	0.35	81.11	34.32		
Charleston AFB, SC	190.00	3.18	124.84		190.00	
Columbus AFB, MS	Unknown	Unknown	Unknown	(100%)		
Craig AFB, AL	Unknown	Unknown	Unknown	(100%)		
Davis-Monthan AFB, AZ	290.00	8.57	271.42		290.00	

Air Force Base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo) Land AF	Land Non-AF	Other
Dover AFB, DE	526.00	5.95	809.23		526.00	
Dyess AFB, TX	40.00	0.76	25.81	40.00		
Edwards AFB, CA	283.00	1.89	749.12	283.00		
Eglin Aux Fld No. 9, FL	95.90	6.53	262.21	95.90		
Eglin AFB, FL	150.00	1.25	124.62	150.00		
Ellsworth AFB, SD	199.00	1.74	404.88		199.00	
England AFB, LA	146.00	3.18	240.37		146.00	
Ent AFB, CO	112.00	6.05	207.84	14.00	98.00	
Fairchild AFB, WA	824.10	7.14	148.14	64.10	760.00	
Forbes AFB, KS	170.00	2.37	809.52		170.00	
F. E. Warren AFB, WY	53.00	1.09	133.96	53.00		
George AFB, CA	192.00	2.76	76.80	192.00		
Goodfellow AFB, TX	8.00	1.49	78.66	8.00		
Grand Forks AFB, ND	310.00	2.37	539.13		310.00	
Griffiss AFB, NY	245.70	4.59	275.76	245.70		
Grissom AFB, IN	236.52	3.64	270.00		236.52	
Gunter AFB, AL	49.30	5.34	176.07		49.3	
Hamilton AFB, CA	200.00	2.96	119.05		200.00	
Hill AFB, UT	179.00	2.51	78.25	179.00		
Holloman AFB, NM	278.00	3.22	269.08	278.00		
Homestead AFB, FL	347.00	4.63	299.81		347.00	
Keesler AFB, MS	728.00	7.05	229.94	76.50	651.50	
Kelly AFB, TX	270.00	7.05	55.38		208.00	62 R

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo)		
				Land		
				AF	Non-AF	Other
Kincheloe AFB, MI	2.80	0.04	196.36		2.80	
Kingsley AFB, OR	92.00	6.05	194.43		87.40	4.6 I-C
Kirtland AFB, NM	125.00	4.17	197.95		125.00	
K. I. Sawyer AFB, MI	338.00	3.25	358.88	338.00		
Lackland AFB, TX	Unknown	Unknown	Unknown	(100%)		
Langley AFB, VA	350.00	5.08	270.00	350.00		
Laredo AFB, TX	Unknown	Unknown	Unknown		(100%)	
Laughlin AFB, TX	219.00	5.58	675.77		219.00	
L. G. Hanscom Fld, MA	300.00	6.22	270.00			300 I-C
Little Rock AFB, AR	17.00	0.19	32.45	0.50	16.50	
Lockbourne AFB, OH	130.00	3.09	433.33		130.00	
Loring AFB, ME	656.00	4.62	192.86	656.00		
Lowry AFB, CO	68.00	2.17	615.08	67.3		0.7
Luke AFB, AZ	93.00	2.01	76.54		93.00	
MacDill AFB, FL	61.00	1.46	84.37	61.00		
Malstrom AFB, MT	456.00	4.02	215.86	456.00		
March AFB, CA	40.00	1.30	37.89	2.00	38.00	
Mather AFB, CA	1215.00	16.33	270.00	1215.00		
Maxwell AFB, AL	344.40	7.73	165.45		344.40	
McChord AFB, WA	115.00	1.85	115.00	115.00		
McClellan AFB, CA	213.00	4.35	74.07		213.00	
McConnell AFB, KS	81.00	3.00	123.63		81.00	
McCoy AFB, FL	109.20	2.07	123.46		109.20	

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo) Land AF	Land Non-AF	Other
McGuire AFB, NJ	324.00	3.52	324.00	324.00		
Minot AFB, ND	1824.00	18.26	375.22	1824.00		
Moody AFB, GA	23.00	3.36	191.08	23.00		
Mountain Home AFB, ID	162.00	1.61	140.64	162.00		
Myrtle Beach AFB. SC	95.80	2.32	160.07	76.60	19.20	
Nellis AFB, NV	229.50	3.43	126.87	229.50		
Norton AFB, CA	3.00	2.57	25.00	3.00		
Offutt AFB, NE	400.00	3.20	114.29		400.00	
Otis AFB, MA	81.00	1.25	270.00	81.00		
Patrick AFB, FL	635.00	6.60	270.00	635.00		
Pease AFB, NH	235.00	5.70	606.97			235 I-C
Perrin AFB, TX	Unknown	Unknown	Unknown		(100%)	
Plattsburgh AFB, NY	171.00	2.02	1081.14	171.00		
Pope AFB, NC	37.00	2.05	99.96		37.00	
Randolph AFB, TX	136.00	2.34	270.00		136.00	
Reese AFB, TX	158.00	6.56	268.71	158.00		
Richards-Gebaur AFB, MO	41.90	1.75	49.97		41.90	
Robins AFB, GA	57.00	0.69	133.75	57.00		
Scott AFB, IL	70.00	0.73	437.50		70.00	
Selfridge AFB, MI	121.00	1.78	78.72	121.00		
Seymour-Johnson AFB, NC	92.00	1.14	184.00		92.00	
Shaw AFB, SC	107.00	2.12	81.73		107.00	

Air Force base	Quantity (ton/mo)	Pounds per person per day	Density (lb/yd^3)	Disposal (ton/mo)		
				Land		
				AF	Non-AF	Other
Sheppard AFB, TX	270.00	4.05	269.87		270.00	
Tinker AFB, OK	142.50	4.80	75.00		142.50	
Travis AFB, CA	Unknown	Unknown	Unknown	(100%)		
Tyndall AFB, FL	321.00	7.28	55.26	256.80	64.20	
Vance AFB, OK	36.00	2.64	103.45		36.00	
Vandenberg AFB, CA	439.00	3.04	149.85	439.00		
Webb AFB, TX	105.00	3.50	54.00		105.00	
Westover AFB, MA	274.00	3.05	114.17		274.00	
Whiteman AFB, MO	600.00	10.37	179.08		600.00	
Williams AFB, AZ	125.00	3.95	250.00	125.00		
Wright-Patterson AFB, OH	512.00	3.51	89.10	512.00		
Wurtsmith AFB, MI	Unknown	Unknown	Unknown	(10%)	(90%)	

Abbreviations used for disposal:

C-Non-Air Force
AF-Air Force
I-Incineration
R-Recycle
H-Hog feed

APPENDIX IV

SEWAGE TREATMENT

Air Force base	Quantity of sludge and grit (lb/mo)	Disposal method		
		Landfill	Fertilizer	Other
Air Force Academy, CO	Unknown	X	X	
Aeronautical Chart and Information Center, St Louis, MO	NT			
Altus AFB, OK	500	X		
Andrews AFB, Wash, DC	31,000	X	X	
Barksdale AFB, LA	NT			
Beale AFB, CA	Unknown	X	X	
Bergstrom AFB, TX	NT			
Blytheville AFB, AR	10,200	X		
Bolling AFB, Wash, DC	NT			
Brooks AFB, TX	NT			
Cannon AFB, NM	(Lagoons)			Lagoons
Carswell AFB, TX	NT			
Castle AFB, CA	1,000	X	X	
Chanute AFB, IL	350,000	X		
Charleston AFB, SC	2,000	X		
Columbus AFB, MS	10,000	X		
Craig AFB, AL	5,000	X		
Davis-Monthan AFB, AZ	NT			
Dover AFB, DE	700	X		
Dyess AFB, TX	NT			

Air Force base	Quantity of sludge and grit (lb/mo)	Disposal method		
		Landfill	Fertilizer	Other
Edwards AFB, CA	9,570	X		
Eglin Aux Fld No. 9, FL	4,000	X		
Eglin AFB, FL	564,000	X		
Ellsworth AFB, SD	24,700	X		
England AFB, LA	(Oxidation pond)			Oxidation pond
Ent AFB, CO	NT			
Fairchild AFB, WA	15,188		X	
Forbes AFB, KS	34,000	X		
F. E. Warren AFB, WY	NT			
George AFB, CA	1,400		X	
Goodfellow AFB, TX	6,000		X	
Grand Forks AFB, ND	(Lagoon)			Lagoon
Griffiss AFB, NY	NT			
Grissom AFB, IN	19,200	X		
Gunter AFB, AL	NT			
Hamilton AFB, CA	10,000	X		
Hill AFB, UT	NT			
Holloman AFB, NM	1,750	X		
Homestead AFB, FL	10,500	X		
Keesler AFB, MS	53,200	X	X	
Kelly AFB, TX	NT			
Kincheloe AFB, MI	7,000	X		
Kingsley AFB, OR	NT			
Kirtland AFB, NM	NT			

Air Force base	Quantity of sludge and grit (lb/mo)	Disposal method		
		Landfill	Fertilizer	Other
K. I. Sawyer AFB, MI	56,000	X		
Lackland AFB, TX	Unknown	X		
Langley AFB, VA	NT			
Laredo AFB, TX	NT			
Laughlin AFB, TX	400	X	X	
L. G. Hanscom Fld, MA	NT			
Little Rock AFB, AR	NT			
Lockbourne AFB, OH	10,000	X		
Loring AFB, ME	4,000	X		
Lowry AFB, CO	NT			
Luke AFB, AZ	8,000	X		
MacDill AFB, FL	Unknown	X		
Malmstrom AFB, MT	5,000	X		
March AFB, CA	15,400	X	X	
Mather AFB, CA	385		X	
Maxwell AFB, AL	NT			
McChord AFB, WA	NT			
McClellan AFB, CA	1,538,700		X	
McConnell AFB, KS	NT			
McCoy AFB, FL	3,400	X		
McGuire AFB, NJ	Unknown	X	X	
Minot AFB, ND	(Lagoon)			Lagoon
Moody AFB, GA	4,330		X	
Mountain Home AFB, ID	(Lagoon)			Lagoon
Myrtle Beach AFB, SC	16,433		X	
Nellis AFB, NV	2,700	X	X	

Air Force base	Quantity of sludge and grit (lb/mo)	Disposal method		
		Landfill	Fertilizer	Other
Norton AFB, CA	NT			
Offutt AFB, NE	Unknown	X		
Otis AFB, MA	1,050,000	X	X	
Patrick AFB, FL	566,000	X	X	
Pease AFB, NH	3,500	X		
Perrin AFB, TX	Unknown		X	
Plattsburgh AFB, NY	NT			
Pope AFB, NC	NT			
Randolph AFB, TX	10,250	X		
Reese AFB, TX	6,030	X	X	
Richards-Gebaur AFB, MO	74,000		X	
Robins AFB, GA	180,000	X		
Scott AFB, IL	Unknown	X		
Selfridge AFB, MI	18,000	X	X	
Seymour-Johnson AFB, NC	NT			
Shaw AFB, SC	17,600	X		
Sheppard AFB, TX	44,000	X		
Tinker AFB, OK	64,000		X	
Travis AFB, CA	25,000		X	
Tyndall AFB, FL	8,800	X	X	
Vance AFB, OK	2,000	X		
Vandenberg AFB, CA	1,250	X (sludge)		Lagoon (grit)
Webb AFB, TX	NT			
Westover AFB, MA	NT			

Air Force base	Quantity of sludge and grit (lb/mo)	Disposal method: Landfill	Disposal method: Fertilizer	Disposal method: Other
Whiteman AFB, MO	16,860	X (grit)	X (sludge)	
Williams AFB, AZ	11,000		X (desert)	
Wright-Patterson AFB, OH	NT			
Wurtsmith AFB, MI	1,200	X		

NT = Installation does not operate its own sewage treatment plant.

APPENDIX V

PATHOLOGICAL WASTES

Air Force base	No. beds	Pounds per week	Pounds per bed per week	Tissue (%)	Plastics (%)	Bandages (%)	Paper (%)	Other (%)	Remarks
Air Force Academy, CO	149	125.0	0.84	40.0	50.00	5.0	5.0		
Aeronautical Chart and Information Center, St Louis MO	0	2.5	---	0.0	9.00	1.0	90.0		
Altus AFB, OK	50	300.0	6.00	50.0	10.00	30.0	10.0		
Andrews AFB. Wash, DC	350	1000.0	2.68	90.0	6.50	1.0	2.0	0.5	Syringes
Barksdale AFB, LA	75	125.0	1.67	20.0	30.00	30.0	20.0		
Beale AFB, CA	50	125.0	2.50	60.3	10.00	29.6	0.1		
Bergstrom AFB, TX	50	50.0	1.00	30.0	60.00	0.0	10.0		
Blytheville AFB, AR	30	100.0	3.33	70.0	28.00	1.0	1.0		Trace drugs
Bolling AFB, Wash, DC	0	5.0	---	0.0	99.00	0.5	0.5		
Brooks AFB, TX	0	860.0	---	95.0	3.00	1.0	1.0	4.0	Incinerators
Cannon AFB, NM	40	45.0	1.13	98.0	1.00	1.0	0.0		
Carswell AFB, TX	250	750.0	3.00	3.0	15.00	65.0	17.0		

Air Force base	No. beds	Pounds per week	Pounds per bed per week	Tissue (%)	Plastics (%)	Bandages (%)	Paper (%)	Other (%)	Remarks
Castle AFB, CA	30	50.0	1.67	10.0	10.00	40.0	30.0	10.0	Serum
Chanute AFB, IL	150	270.0	1.80	5.0	20.00	5.0	50.0	20.0	Kitchen waste
Charleston AFB, SC	6	5.0	0.83	0.0	64.00	30.0	6.0		
Columbus AFB, MS	35	75.0	2.14	20.0	10.00	10.0	60.0		
Craig AFB, AL	12	28.0	2.33	0.0	25.00	50.0	25.0		
Davis-Monthan AFB, AZ	90	150.0	1.67	80.0	3.00	3.0	4.0	10.0	Fifty-pound portion
Dover AFB, DE	55	30.0	0.55	10.0	25.00	25.0	35.0	5.0	Cardboard
Dyess AFB, TX	50	650.0	13.00	0.5	40.00	1.0	40.0	18.5	Drugs, etc.
Edwards AFB, CA	45	45.0	1.00	80.0	10.00	5.0	5.0		
Eglin Aux. Fld No. 9, FL	0	5.0	---	25.0	25.00	25.0	25.0		
Eglin AFB, FL	225	850.0	3.78	17.5	11.80	47.1	23.6		
Ellsworth AFB, SD	100	100.0	1.00	95.0	0.00	2.5	2.5		
England AFB, LA	40	20.0	0.50	15.0	35.00	40.0	10.0		
Ent AFB, CO	0	35.0	---	0.0	20.00	10.0	70.0		
Fairchild AFB, WA	100	100.0	1.00	20.0	30.00	30.0	20.0		
Forbes AFB, KS	100	5.5	0.06	0.0	80.00	5.0	15.0		

Air Force base	No. beds	Pounds per week	Pounds per bed per week	Tissue (%)	Plastics (%)	Bandages (%)	Paper (%)	Other (%)	Remarks
F. E. Warren AFB, WY	30	50.0	0.83	20.0	30.00	30.0	20.0		
George AFB, CA	40	58.0	1.45	26.0	30.00	0.0	30.0	14.0	Glass, blood, etc.
Goodfellow AFB, TX	25	1.0	0.04	0.0	70.00	10.0	20.0		
Grand Forks AFB, ND	50	15.0	0.30	93.0	5.00	1.0	1.0		
Griffiss AFB, NY	40	8.0	0.20	90.0	0.00	10.0	0.0		
Grissom AFB, IN	25	50.0	2.00	85.0	10.00	5.0	0.0		
Gunter AFB, AL	0	5.0	---	15.0	5.00	70.0	0.0		
Hamilton AFB, CA	55	25.0	0.45	40.0	6.00	12.0	30.0	12.0	Splints, vials, test tubes
Hill AFB, UT	40	Unknown	Unknown	6.0	80.00	1.0	13.0		
Holloman AFB, NM	40	Unknown	Unknown	(----------Unknown----------)					
Homestead AFB, FL	90	750.0	8.33	(----------Unknown----------)					
Keesler AFB, MS	400	15.0	0.04	5.0	25.00	70.0	0.0		
Kelly AFB, TX	0	0.0	---	0.0	3.00	96.0	1.0		
Kincheloe AFB, MI	30	25.0	0.83	20.0	10.00	50.0	20.0		
Kingsley AFB, OR	4	10.0	2.50	2.0	60.00	35.0	3.0		
Kirtland AFB, NM	0	25.0	---	0.0	20.00	0.0	0.0	80.0	Petri dishes

Air Force base	No. beds	Pounds per week	Pounds per bed per week	Tissue (%)	Plastics (%)	Bandages (%)	Paper (%)	Other (%)	Remarks
K. I. Sawyer AFB, MI	50	10.0	0.20	0.0	30.00	30.0	20.0	20.0	Cultures
Lackland AFB, TX	1000	2300.0	2.30	21.1	26.30	(---------52.6--------)			
Langley AFB, VA	125	150.0	1.20	0.0	20.00	60.0	0.0	20.0	Needles
Laredo AFB, TX	25	57.0	2.28	5.0	50.00	0.0	45.0		
Laughlin AFB, TX	50	15.0	0.30	90.0	8.00	2.0	0.0		
L. G. Hanscom Fld, MA	0	<1.0	---	---	---	---	---	---	
Little Rock AFB, AR	50	6.0	0.12	80.0	0.00	15.0	5.0		
Lockbourne AFB, OH	50	150.0	3.00	10.0	5.00	20.0	65.0		
Loring AFB, ME	100	90.0	0.90	5.0	0.00	95.0	0.0		
Lowry AFB, CO	0	5.0	---	0.0	100.00	0.0	0.0		
Luke AFB, AZ	70	100.0	1.43	(----------Unknown----------)					
MacDill AFB, FL	200	100.0	0.50	45.0	25.00	0.0	15.0	15.0	Formalin
Malmstrom AFB, MT	76	30.0	0.39	80.0	10.00	0.0	10.0		
March AFB, CA	175	Unknown	Unknown	3.0	12.00	35.0	50.0		
Mather AFB, CA	103	130.0	1.26	40.0	25.00	20.0	14.0	1.0	Metal
Maxwell AFB, AL	225	250.0	1.11	15.0	5.00	70.0	0.0	10.0	Unknown

Air Force base	No. beds	Pounds per week	Pounds per bed per week	Tissue (%)	Plastics (%)	Bandages (%)	Paper (%)	Other (%)	Remarks
McChord AFB, WA	0	35.0	---	1.0	25.00	19.0	55.0		
McClellan AFB, CA	0	15.0	---	5.0	10.00	10.0	60.0	5.0	Glass
McConnell AFB, KS	45	12.0	0.27	100.0	0.00	0.0	0.0		
McCoy AFB, FL	0	100.0	---	2.0	3.00	95.0	0.0		
McGuire AFB, NJ	0	250.0	---	0.0	10.00	80.0	0.0	10.0	Needles, glass
Minot AFB, ND	100	150.0	1.50	75.0	5.00	15.0	5.0		
Moody AFB, GA	35	1810.0	51.71	0.5	10.00	20.0	10.0	59.5	Glass, etc.
Mountain Home AFB, ID	50	20.0	0.40	95.0	2.00	2.0	1.0		
Myrtle Beach AFB, SC	50	1000.0	20.00	1.0	40.00	5.0	50.0	4.0	Rubber, glass, etc.
Nellis AFB, NV	65	15.0	0.23	0.0	90.00	0.5	9.5		
Norton AFB, CA	12	6.0	0.50	5.0	76.00	19.0	0.0		
Offutt AFB, NE	125	2500.0	20.00	30.0	30.00	30.0	0.0	10.0	Miscellaneous
Otis AFB, MA	10	50.0	5.00	0.0	80.00	20.0	0.0		
Patrick AFB, FL	75	10.0	0.13	75.0	5.00	10.0	10.0		
Pease AFB, NH	0	10.0	---	0.0	50.00	50.0	0.0		
Perrin AFB, TX	10	Unknown	Unknown	(----------Unknown----------					)
Plattsburgh AFB, NY	50	200.0	4.00	90.0	0.00	10.0	0.0		

Air Force base	No. beds	Pounds per week	Pounds per bed per week	Tissue (%)	Plastics (%)	Bandages (%)	Paper (%)	Other (%)	Remarks
Pope AFB, NC	0	Unknown	Unknown	0.0	50.00	0.0	0.0	50.0	Media for bacteriology
Randolph AFB, TX	40	655.0	16.38	0.0	10.00	10.0	65.0	15.0	Glass
Reese AFB, TX	30	200.0	6.67	11.0	10.00	9.0	70.0		
Richards-Gebaur AFB, MO	33	40.0	1.21	90.0	3.00	2.0	5.0		
Robins AFB, GA	60	955.0	15.92	32.5	25.00	35.0	7.5		
Scott AFB. IL	300	102.0	0.34	3.0	3.00	4.0	80.0	10.0	IV glass bottles
Selfridge AFB, MI	10	10.0	1.00	25.0	25.00	25.0	25.0		
Seymour-Johnson AFB, NC	40	25.0	0.63	0.0	5.00	75.0	20.0		
Shaw AFB, SC	90	50.0	0.56	10.0	15.00	5.0	70.0		
Sheppard AFB, TX	300	60.0	0.20	66.7	12.50	8.3	12.5		
Tinker AFB, OK	75	102.5	1.37	1.0	74.00	25.0	0.0		
Travis AFB, CA	385	1500.0	3.90	2.0	13.00	1.0	15.0	69.0	Cloth (isolation ward)
Tyndall AFB, FL	60	105.0	1.75	30.0	60.00	10.0	0.0		
Vance AFB, OK	0	0.0	---	---	---	---	---	---	
Vandenberg AFB, CA	125	22700.0	181.60	0.3	1.28	0.8	97.62	1.0	Bottles, containers
Webb AFB, TX	25	25.0	1.00	95.0	3.00	2.0	0.0		

Air Force base	No. beds	Pounds per week	Pounds per bed per week	Tissue (%)	Plastics (%)	Bandages (%)	Paper (%)	Other (%)	Remarks
Westover AFB, MA	100	40.0	0.40	60.0	35.00	2.0	3.0		
Whiteman AFB, MO	30	100.0	3.33	75.0	10.00	15.0	0.0		
Williams AFB, AZ	25	125.0	5.00	7.0	13.00	40.0	39.0	1.0	Rubber, needles, etc.
Wright-Patterson AFB, OH	425	360.0	0.85	25.0	25.00	25.0	25.0		
Wurtsmith AFB, MI	25	50.0	2.00	50.0	30.00	15.0	2.0	3.0	Syringes

APPENDIX VI

CLASSIFIED WASTES

Air Force base	Quantity (lb/mo)	Method of disposal: Incineration (lb/mo)	Grinding (lb/mo)	Pulping (lb/mo)	Age of incinerator (yrs)
Air Force Academy, CO	350	0	0	350	---
Aeronautical Chart and Information Center, St Louis, MO	85,000	59,000	8,500	17,000	3
Altus AFB, OK	5,000	5,000	0	0	3
Andrews AFB, Wash, DC	260,000	247,000	0	13,000	11
Barksdale AFB, LA	6,300	1,260	0	5,040	1
Beale AFB, CA	37,620	0	37,620	0	---
Bergstrom AFB, TX	1,750	245	0	1,505	4
Blytheville AFB, AR	30	30	0	0	9
Bolling AFB, Wash, DC	100	100	0	0	---
Brooks AFB, TX	40	25	15	0	5
Cannon AFB, NM	600	540	0	60	7
Carswell AFB, TX	2,500	2,500	0	0	Unknown
Castle AFB, CA	200	0	200	0	---
Chanute AFB, IL	Unknown	(100%)	0	0	3
Charleston AFB, SC	600	600	0	0	---

Air Force base	Quantity (lb/mo)	Method of disposal: Incineration (lb/mo)	Grinding (lb/mo)	Pulping (lb/mo)	Age of incinerator (yrs)
Columbus AFB, MS	400	400	0	0	10
Craig AFB, AL	450	405	0	45	10
Davis-Monthan AFB, AZ	3,000	3,000	0	0	4
Dover AFB, DE	400	0	400	0	---
Dyess AFB, TX	60	60	0	0	9
Edwards AFB, CA	2,050	100	1,950	0	1/2
Eglin Aux Fld No. 9, FL	100	0	0	100	---
Eglin AFB, FL	80,000	0	0	80,000	---
Ellsworth AFB, SD	1,350	540	810	0	6
England AFB, LA	350	350	0	0	5
Ent AFB, CO	2,450	245	0	2,205	7, 2
Fairchild AFB, WA	2,500	2,500	0	0	4
Forbes AFB, KS	22	22	0	0	11
F. E. Warren AFB, WY	1,200	24	1,176	0	6
George AFB, CA	100	100	0	0	Unknown
Goodfellow AFB, TX	17,600	17,600	0	0	4
Grand Forks AFB, ND	5,000	5,000	0	0	2
Griffiss AFB, NY	6,000	6,000	0	0	Boiler
Grissom AFB, IN	1,320	753	567	0	16

Air Force base	Quantity (lb/mo)	Method of disposal: Incineration (lb/mo)	Grinding (lb/mo)	Pulping (lb/mo)	Age of incinerator (yrs)
Gunter AFB, AL	5	5	0	0	Unknown
Hamilton AFB, CA	45	45	0	0	Unknown
Hill AFB, UT	28,000	28,000	0	0	3
Holloman AFB, NM	490	90	0	400	27
Homestead AFB, FL	3,600	3,600	0	0	5
Keesler AFB, MS	1,150	1,150	0	0	12
Kelly AFB, TX*	716,000	106,200	0	574,000	28
Kincheloe AFB, MI	458	458	0	0	Boiler
Kingsley AFB, OR	750	750	0	0	8
Kirtland AFB, NM	2,400	2,400	0	0	5
K. I. Sawyer AFB, MI	1,300	1,300	0	0	9
Lackland AFB, TX	31,600	31,000	0	600	1, 9
Langley AFB, VA	12,000	10,080	1,290	0	---
Laredo AFB, TX	360	0	360	0	---
Laughlin AFB, TX	100	98	0	2	12
L. G. Hanscom Fld, MA	60,000	60,000	0	0	12
Little Rock AFB, AR	25	25	0	0	6

*35,800 pounds of classified material are buried on the base.

Air Force base	Quantity (lb/mo)	Method of disposal: Incineration (lb/mo)	Grinding (lb/mo)	Pulping (lb/mo)	Age of incinerator (yrs)
Lockbourne AFB, OH	250	250	0	0	13
Loring AFB, ME	1,000	1,000	0	0	5
Lowry AFB, CO	Unknown	(100%)	0	0	27, 4
Luke AFB, AZ	800	800	0	0	2
MacDill AFB, FL	Unknown	(100%)	0	0	2
Malmstrom AFB, MT	3,700	1,100	0	2,600	15, 15
March AFB, CA	11,000	11,000	0	0	6
Mather AFB, CA	280	280	0	0	8
Maxwell AFB, AL	325	325	0	0	9
McChord AFB, WA	120	120	0	0	5
McClellan AFB, CA	2,500	2,250	0	250	7
McConnell AFB, KS	400	400	0	0	8
McCoy AFB, FL	1,720	1,720	0	0	10
McGuire AFB, NJ	1,200	1,200	0	0	11
Minot AFB, ND	200	100	0	100	15
Moody AFB, GA	0.5	0.5	0	0	Boiler
Mountain Home AFB, ID	1,000	1,000	0	0	Boiler
Myrtle Beach AFB, SC	2,080	2,080	0	0	3

Air Force base	Quantity (lb/mo)	Method of disposal: Incineration (lb/mo)	Grinding (lb/mo)	Pulping (lb/mo)	Age of incinerator (yrs)
Nellis AFB, NV	2,000	0	0	2,000	None
Norton AFB, CA	6,000	6,000	0	0	2
Offutt AFB, NE	108,840	108,840	0	0	12
Otis AFB, MA	100	100	0	0	Boiler
Patrick AFB, FL	18,400	920	0	17,480	Burn barrel
Pease AFB, NH	100	90	0	10	Unknown
Perrin AFB, TX	140	0	140	0	None
Plattsburgh AFB, NY	500	500	0	0	4
Pope AFB, NC	105	105	0	0	2
Randolph AFB, TX	10,000	0	0	10,000	None
Reese AFB, TX	180	180	0	0	3
Richards-Gebaur AFB, MO	100	100	0	0	15
Robins AFB, GA	3,000	0	0	3,000	None
Scott AFB, IL	6,000	0	6,000	0	None
Selfridge AFB, MI	150	0	0	150	None
Seymour-Johnson AFB, NC	750	750	0	0	10
Shaw AFB, SC	1,800	1,800	0	0	5
Sheppard AFB, TX	150	150	0	0	9
Tinker AFB, OK	6,320	6,320	0	0	3, 5
Travis AFB, CA	5,000	2,500	0	2,500	6
Tyndall AFB, FL	1,500	1,500	0	0	1

Air Force base	Quantity (lb/mo)	Method of disposal: Incineration (lb/mo)	Grinding (lb/mo)	Pulping (lb/mo)	Age of incinerator (yrs)
Vance AFB, OK	85	85	0	0	1
Vandenberg AFB, CA	19,244	16,000	3,052	192	3, 6
Webb AFB, TX	35	35	0	0	15
Westover AFB, MA	30,000	0	30,000	0	---
Whiteman AFB, MO	500	500	0	0	17
Williams AFB, AZ	200	0	200	0	---
Wright-Patterson AFB, OH	7,500	4,900	0	2,600	10, 20, 25
Wurtsmith AFB, MI	940	940	0	0	8

APPENDIX VII

LIQUID INDUSTRIAL WASTES AND FIRE FIGHTING TRAINING

Air Force base	Engine oil		Hydraulic fluid		Industrial fluids		Contaminated fuel		Fire fighting	
	Gal/mo	Disposal	Gal/mo	Disposal	Gal/mo	Disposal	Gal/mo	Disposal	Fires per qtr	Fuel gal/fire
Air Force Academy, CO	1,000	C	.....Included under engine oil.....						4.0	100
Aeronautical Chart and Information Center, St Louis, MO	20	D	1	D	0		0		0.0	0
Altus AFB, OK	500	C	100	C	100	C	4,000	C&F	13.0	500
Andrews AFB, Wash, DC	3,000	C	100	C	200	C	4,000	C	12.0	300
Barksdale AFB, LA	1,860	C	450	C	8,016	S	6,100	C	24.0	600
Beale AFB, CA	18,800	F	.....Included under engine oil.....						24.0	625
Bergstrom AFB, TX	200	ST	5	F	10	L	1,200	F	3.0	300
Blytheville AFB, AR	500	ST	0		0		1,000	F	3.0	1,000
Bolling AFB, Wash, DC	80	C	2	C	1	C	0		8.0	900
Brooks AFB, TX	55	L	0		0		0		0.5	40
Cannon AFB, NM	2,000	D	235	D	915	L	1,160	F&D	50.0	200

Air Force base	Engine oil Gal/mo	Engine oil Disposal	Hydraulic fluid Gal/mo	Hydraulic fluid Disposal	Industrial fluids Gal/mo	Industrial fluids Disposal	Contaminated fuel Gal/mo	Contaminated fuel Disposal	Fire fighting Fires per qtr	Fire fighting Fuel gal/fire
Carswell AFB, TX	1,800	C	65	C	150	L	200	F	8.0	563
Castle AFB, CA	2,400	C	330	C	130	C	4,050	C	14.0	500
Chanute AFB, IL	1,000	C	.....Included under engine oil....				1,000	C	16.0	5
Charleston AFB, SC	1,900	C	200	C	1,000	C	2,300	C	13.0	500
Columbus AFB, MS	150	D	10	L	250	L&S	400	F	13.0	400
Craig AFB, AL	150	C&L	20	L	350	C&L	500	F	15.0	500
Davis-Monthan AFB, AZ	8,000	D	20	D	0		2,500	E	43.0	500
Dover AFB, DE	925	C	200	St	220	St	1,500	C	9.0	400
Dyess AFB, TX	2,000	D	200	D	900	D	100	L	12.0	1,000
Edwards AFB, CA	300	D	800	C	30	D	1,200	C	13.0	500
Eglin Aux Fld No. 9, FL	980	C	20	C	55	C	400	F	13.0	300
Eglin AFB, FL	400	C	718	C	12	C	20	C	26.0	300
Ellsworth AFB, SD	2,540	C	62	C	40	L	1,700	C	12.0	500
England AFB, LA	1,864	C	387	C	2,813	C	4,923	C&F	24.0	300
Ent AFB, CO	2,100	CF&D	15	CF&D	350	CF&D	0		12.0	50
Fairchild AFB, WA	750	C	200	C	100	C	150	F	12.0	635

Air Force base	Engine oil		Hydraulic fluid		Industrial fluids		Contaminated fuel		Fire fighting	
	Gal/mo	Disposal	Gal/mo	Disposal	Gal/mo	Disposal	Gal/mo	Disposal	Fires per qtr	Fuel gal/fire
Forbes AFB, KS	4,000	C	0		0		0		1.0	100
F. E. Warren AFB, WY	500	C	0		0		0		3.0	833
George AFB, CA	325	C	50	C	1,000	St	150	C	22.0	400
Goodfellow AFB, TX	150	C&D	5	C&D	5	C&D	5	C&D	6.0	300
Grand Forks AFB, ND	400	C	20	C	20	C	550	C	2.0	3,000
Griffiss AFB, NY	2,500	C	50	C	600	C	3,500	C	1.0	60
Grissom AFB, IN	1,070	C	25	C	270	C	1,600	F	6.0	700
Gunter AFB, AL	400	C&L	0		0		0		0.0	
Hamilton AFB, CA	100	C	70	C	300	C	115	C	5.0	500
Hill AFB, UT	13,000	L	.....Included under engine oil.....						4.0	300
Holloman AFB, NM	400	St	50	St	100	St	7,500	F&St	10.0	250
Homestead AFB, FL	800	F	200	F	200	F	3,000	F	12.0	117
Keesler AFB, MS	1,200	F	0		400	S	385	F	6.0	350
Kelly AFB, TX	8,000	C	0		12,000	C	20,000	E	7.0	875
Kincheloe AFB, MI	100	F	50	F	15	F	0		2.0	100

Air Force base	Engine oil Gal/mo	Engine oil Disposal	Hydraulic fluid Gal/mo	Hydraulic fluid Disposal	Industrial fluids Gal/mo	Industrial fluids Disposal	Contaminated fuel Gal/mo	Contaminated fuel Disposal	Fire fighting Fires per qtr	Fire fighting Fuel gal/fire
Kingsley AFB, OR	200	C	0		12	C	500	F	18.0	83
Kirtland AFB, NM	600	L	30	L	0		50	F	6.0	900
K. I. Sawyer AFB, MT	1,780	D	55	D	2,700	D	4,400	F	10.0	1,200
Lackland AFB, TX	275	C	10	C	100	I	0		6.0	25
Langley AFB, VA	1,500	C	300	C	15	C	1,200	C	9.0	110
Laredo AFB, TX	55	D	110	D	50	L	944	F	12.0	300
Laughlin AFB, TX	50	L	70	L	0		200	F	13.0	900
L. G. Hanscom AFB, MA	150	C	150	C	3,000	I	400	F	12.0	1,100
Little Rock AFB, AR	500	C	50	C	10	C	2,500	C	9.0	900
Lockbourne AFB, OH	1,570	C	380	C	10	C	3,470	C	3.0	500
Loring AFB, ME	1,964	C	.....Included under engine oil....				5,000	C	21.0	500
Lowry AFB, CO	340	C	20	C	2,350	L&S	0		3.0	75
Luke AFB, AZ	0		0		5,000	D	15,000	L	6.0	900
MacDill AFB, FL	550	C	150	C	200	L	1,200	C	24.0	300
Malmstrom AFB, MT	1,100	L	60	L	50	L	240	F	24.0	300

Air Force base	Engine oil		Hydraulic fluid		Industrial fluids		Contaminated fuel		Fire fighting	
	Gal/mo	Disposal	Gal/mo	Disposal	Gal/mo	Disposal	Gal/mo	Disposal	Fires per qtr	Fuel gal/fire
March AFB, CA	250	C	0		1,400	C	800	C	1.0	750
Mather AFB, CA	580	C	180	C	350	C	9,445	C&F	26.0	667
Maxwell AFB, AL	418	C	84	C	4,000	C	135	C	10.0	55
McChord AFB, WA	190	C	275	C	110	C	1,000	C	3.0	150
McClellan AFB, CA	50,000	C	.....Included under engine oil.....						6.0	650
McConnell AFB, KS	555	St	400	St	5	St	1,900	St	3.0	300
McCoy AFB, FL	325	C	30	C	0		2,600	F	12.0	2,000
McGuire AFB, NJ	19,600	C	500	C	24,000	C	1,500	C	6.0	500
Minot AFB, ND	1,050	F	0		2,100	F	1,200	F	3.0	500
Moody AFB, GA	1,150	C	40	C	870	C	600	F	36.0	300
Mountain Home AFB, ID	600	C	30	C	25	C	1,500	C&F	24.0	300
Myrtle Beach AFB, SC	1,650	C	.....Included under engine oil....				600	F	6.0	300
Nellis AFB, NV	500	D	50	D	0		1,000	D	10.0	300
Norton AFB, CA	1,000	C	Unknown		1,500		4,500	C	6.0	500
Offutt AFB, NE	1,150	C	40	C	50	C	400	C	30.0	500
Otis AFB, MA	525	D	.....Included under engine oil.....						3.0	667

Air Force base	Engine oil Gal/mo	Engine oil Disposal	Hydraulic fluid Gal/mo	Hydraulic fluid Disposal	Industrial fluids Gal/mo	Industrial fluids Disposal	Contaminated fuel Gal/mo	Contaminated fuel Disposal	Fire fighting Fire per qtr	Fire fighting Fuel gal/fire
Patrick AFB, FL	440	F	600	F	0		0		10.0	750
Pease AFB, NH	220	C	5	I	300	I	600	F	24.0	800
Perrin AFB, TX	3,000	C	.....Total included under engine oil.....						1.0	300
Plattsburgh AFB, NY	250	C	..Totai included under engine oil..				700	C	3.0	400
Pope AFB, NC	700	C	.Included under engine oil..		0		2,500	F	26.0	312
Randolph AFB, TX	515	C	75	C	0		4,765	C	27.0	300
Reese AFB, TX	200	L	75	L	650	L	0		13.0	1,250
Richard-Gebaur AFB, MO	1,800	C	50	C	1,200	C	0		6.0	110
Robins AFB, GA	3,208	C	916	C	4,916	C	17,033	C&F	18.0	500
Scott AFB, IL	1,000	C	900	C	0		0		2.0	150
Selfridge AFB, MI	100	C	0		0		50		6.0	50
Seymour-Johnson AFB, NC	310	C	Unknown		Unknown		5,000	C	13.0	300
Shaw AFB, SC	1,000	C	200	C	800	C	3,000	C&F	39.0	300
Sheppard AFB, TX	1,041	C	Unknown		400	E	100	F	6.0	2,000
Tinker AFB, OK	4,000	C	720	C	51,611	C	15,108	C	12.0	1,000

Air Force base	Engine oil Gal/mo	Engine oil Disposal	Hydraulic fluid Gal/mo	Hydraulic fluid Disposal	Industrial fluids Gal/mo	Industrial fluids Disposal	Contaminated fuel Gal/mo	Contaminated fuel Disposal	Fire fighting Fires per qtr	Fire fighting Fuel gal/fire
Travis AFB, CA	2,950	C	Unknown	C	250	C	7,411	C	15.0	1,000
Tyndall AFB, FL	385	C	15	F	10	F	300	F	6.0	500
Vance AFB, OK	190	L	60	L	7,500	C&S	300	L	13.0	500
Vandenberg AFB, CA	2,050	C	23	C	230	C	(70#)	F	20.0	50
Webb AFB, TX	200	C	25	C	10	C	1,100	F	12.0	1,400
Westover AFB, MA	2,000	C	..included under fluids.....		700	F	2,000	F	9.0	1,000
Whiteman AFB, MO	425	C	40	C	0		200	F	12.0	1,250
Williams AFB, AZ	660	L	100	L	5	L	0		3.0	1,000
Wright-Patterson AFB, OH	2,500	C	500	C	4,000	C	20,000	C	6.0	1,000
Wurtsmith AFB, MI	1,650	L	55	L	30	L	1,700	L	3.0	3,000

Abbreviations used in disposal:

C - contract
D - dust control
F - fire department
St - storage
S - sewer/storm drain
L - land
E - evaporation
I - industrial waste plant

APPENDIX VIII

PESTICIDES AND HERBICIDES IN STORAGE

Air Force base	Item	Amount
Air Force Academy, CO	DDT powder	75 lb
	DDT liquid	135 gal
	Dieldrin liquid	40 gal
	Chlordane liquid	70 gal
	Chlordane powder	180 lb
	Toxaphene	20 gal
	Lindane powder	50 lb
	Lindane liquid	5 gal
	Heptachlor	15 gal
Aeronautical Chart and Information Center, St Louis, MO	DDT wettable powder (75 percent)	50 lb
	DDT (25 percent)	55 gal
Altus AFB, OK	UROX-22 nonselective soil sterilant	Total of 10-15 gal
	Cholora 125 nonselective soil sterilant	
	Pre-san selective herbicide for crabgrass and Poa Annua control of golf course	
	"Tritac" nonselective herbicide for control of bindweed	
	Dowpon herbicide for control of cattails in drainage ditches	
Andrews AFB, Wash, DC	None	
Barksdale AFB, LA	None	
Beale AFB, CA	DDT wettable powder (50 percent)	100 lb
	DDT wettable powder (100 percent)	200 lb
	DDT emulsion (57 percent)	300 gal
	DDT (5 percent, 2 percent chlordane oil base)	150 gal
	Malathion water emulsion (57 percent)	330 gal
Bergstrom AFB, TX	None	
Blytheville AFB, AR	None	
Bolling AFB, Wash, DC	None	
Brooks AFB, TX	None	
Cannon AFB, NM	DDT	480 lb
Carswell AFB, TX	None	

Air Force base	Item	Amount
Castle AFB, CA	Cyanogas	150 lb
Chanute AFB, IL	None	
Charleston AFB, SC	DDT (2 percent)	275 gal
	DDT (75 percent)	50 lb
Columbus AFB, MS	DDT (20 percent concentrate)	100 gal
Craig AFB, AL	None	
Davis-Monthan AFB, AZ	MASDC has 11,750 pounds of DDT stored for disposal; awaiting instructions from DOD for 18 months	11,750 lb
Dover AFB, DE	None	
Dyess AFB, TX	None	
Edwards AFB, CA	None	
Eglin Aus Fld No. 9, FL	DDT emulsion (25 percent)	75 gal
	Wettable powder concentrate (75 percent)	50 lb
Eglin AFB, FL	None	
Ellsworth AFB, SD	None	
England AFB, LA	None	
Ent AFB, CO	None	
Fairchild AFB, WA	None	
Forbes AFB, KS	None	
F. E. Warren AFB, WY	Chlordane	15 gal
	Dieldrin	5 gal
George AFB, CA	None	
Goodfellow AFB, TX	None	
Grand Forks AFB, ND	DDT granules (5 percent)	1,200 lb
Griffiss AFB, NY	DDT solution (5 percent)	125 gal
	DDT emulsion (25 percent)	55 gal
	Vapona (41.4 percent)	55 gal
Grissom AFB, IN	None	

Air Force base	Item	Amount
Gunter AFB, AL	None	
Hamilton AFB, CA	None	
Hill AFB, UT	Chlordane, dust (5 percent)	175 lb
	Chlordane technical	500 lb
	Dieldrin emulsifiable (18 percent)	50 lb
	Dieldrin (2-1/2 percent)	400 lb
	Lindane emulsifiable (20 percent)	10 gal
	Lindane wettable powder (75 percent)	15 lb
Holloman AFB, NM	None	
Homestead AFB, FL	DDT	110 gal
Keesler AFB, MS	None	
Kelly AFB, TX	None	
Kincheloe AFB, MI	Chlordane 6846-270-8262	25 gal
	Chlordane 6846-270-8262	5 gal
	Dieldrin	3 gal
	DDT 6840-2540	40 lb
Kingsley AFB, OR	DDT	10 gal
Kirtland AFB, NM	245 T herbicide	55 gal
K. I. Sawyer AFB, MI	Mercurial fungicides	600 lb
Lackland AFB, TX	None	
Langley AFB, VA	None	
Laredo AFB, TX	None	
Laughlin AFB, TX	None	
L. G. Hanscom Fld, MA	None	
Little Rock AFB, AR	None	
Lockbourne AFB, OH	None	
Loring AFB, ME	DDT dust (10 percent)	30 lb
Lowry AFB, CO	None	
Luke AFB, AZ	None	
MacDill AFB, FL	None	

Air Force base	Item	Amount
Malmstrom AFB, MT	None	
March AFB, CA	None	
Mather AFB, CA	None	
Maxwell AFB, AL	None	
McChord AFB, WA	None	
McClellan AFB, CA	DDT 6840-766-9631	1 lb
	DDT 6840NL	150 lb
	DDT dust (10 percent) 6840-242-4213	99 lb
	Lindane 6840-281-3462	15,966 lb
	Insect repellant 6840-558-0918	9 lb
	Chlordane 6840NL	2,080 lb
	DDT 6840-281-3462	9,980 lb
	DDT 6840-253-3892	6,435 lb
	DDT 6840-NL	1,540 lb
	DDT 6840-559-4514	47 lb
	DDT 6840-281-3462	3,300 lb
	DDT 6840-543-4038	188 lb
	DDT 6840NL	168 lb
McConnell AFB, KS	None	
McCoy AFB, FL	None	
McGuire AFB, NJ	DDT emulsible (25 percent)	40 gal
	Lindane emulsible (12 percent)	25 gal
	Awaiting word on disposal from MAC	
Minot AFB, ND	None	
Moody AFB, GA	DDT	3,695 gal
Mountain Home AFB, ID	None	
Myrtle Beach AFB, SC	None	
Nellis AFB, NV	None	
Norton AFB, CA	None	
Offutt AFB, NE	None	
Otis AFB, MA	None	
Patrick AFB, FL	Sodium arsenite	60 gal
Pease AFB, NH	None	

Air Force base	Item	Amount
Perrin AFB, TX	DDT	145 gal
	2-4-D	15 gal
Plattsburgh AFB, NY	Chlordane (2 percent) + DDT (5 percent)	4 gal
	DDT dusting powder (10 percent)	75 gal
	Dieldrin solution (0.5 percent)	3 gal
	Dieldrin emulsifiable concentrate (15 percent)	10 gal
Pope AFB, NC	None	
Randolph AFB, TX	None	
Reese AFB, TX	None	
Richards-Gebaur AFB, MO	Mercury base herbicide	30 lb
	Calocure	125 lb
	Senesana	25 lb
Robins AFB, GA	DDT powder, wettable (75 percent)	165 gal
	Chlordane dust (5 percent)	5 gal
	DDT emulsible concentrate (25 percent)	5 gal
	DDT (10 percent) + lindane oil solution (2 percent)	30 gal
Scott AFB, IL	Chlordane dust 6840-543-7825	1,970 lb
Selfridge AFB, MI	None	
Seymour-Johnson AFB, NC	None	
Shaw AFB, SC	None	
Sheppard AFB, TX	DDT dust (10 percent)	360 lb
	DDT emulsion (25 percent)	30 gal
	DDT dusting powder (10 percent)	93 lb
	DDT dust (75 percent)	50 lb
	Dieldrin concentrate (18 percent)	40 gal
	Dieldrin dust	500 lb
	Chlordane dust	600 lb
	BHC dust	600 lb
	Lead arsenate dust	500 lb
	Lindane	5 gal
Tinker AFB, OK	None	
Travis AFB, CA	None	
Tyndall AFB, FL	BHC dust (50 percent)	1,000 lb
	Lindane dust (1 percent)	1,950 lb
	DDT 25 (75 percent)	6,000 gal
Vance AFB, OK	DDT dust (10 percent	50 lb
	DDT diluted powder (10 percent)	85 lb
	2-4-D	25 gal

Air Force base	Item	Amount
Vandenberg AFB, CA	DDT (25 percent)	140 gal
	Dieldrin (15 percent)	120 gal
Webb AFB, TX	None	
Westover AFB, MA	None	
Whiteman AFB, MO	None	
Williams AFB, AZ	None	
Wright-Patterson AFB, OH	DDT powder wettable (75 percent)	250 lb
	DDT dust (10 percent)	10 lb
	DDT oil solution (5 percent)	15 gal
	DDT powder micronized (50 percent)	15 lb
Wurtsmith AFB, MI	None	

APPENDIX IX

SEDIMENTATION FROM EROSION

Air Force base	Erodibility	Erosion control practices	Area currently denuded (acres)
Air Force Academy, CO	Severe	Ditching to prevent runoff, mulching, grading	16.00
Aeronautical Chart and Information Center, St Louis, MO	Slight	Due to limited construction of new facilities at this installation, no erosion problems have been encountered	0.00
Altus AFB, OK	Slight	Level terrain does not erode	2.00
Andrews AFB, Wash, DC	Moderate	None	3.00
Barksdale AFB, LA	Slight	None	5.00
Beale AFB, CA	Moderate	Minimum removal of vegetation, replacement of vegetation, paving, rip-raping, grading, and compacting	10.00
Bergstrom AFB, TX	Slight	None; area is generally flat and little runoff occurs except during infrequent, heavy thunder showers	17.00
Blytheville AFB, AR	Slight	None	2.00
Bolling AFB, Wash, DC	Slight	Recent construction projects on this base have been performed on level ground with no provisions made for erosion control	2.00
Brooks AFB, TX	Slight	Grading and early completion of storm drainage structures; on a recent project turfing was accomplished immediately after final exterior wall completion; this practice helped immensely and helped to keep the site cleaner	0.25
Cannon AFB, NM	Slight	Watering, rolling, compaction	5.00

Air Force base	Erodibility	Erosion control practices	Area currently denuded (acres)
Carswell AFB, TX	Slight	Storm water routes stabilized, vegetation undisturbed where possible; mulch or plastic covering to protect slopes; aggregate blankets; asphalt penetration treatments	4.00+
Castle AFB, CA	Slight	Land is so flat that no requirement for erosion control exists	4.00
Chanute AFB, IL	Slight	None	0.50
Charleston AFB, SC	Slight	None required; terrain is very flat and level	0.00
Columbus AFB, MO	Slight	Gentle, sloping grades to prevent rapid runoff	0.00
Craig AFB, AL	Slight	None	0.00
Davis-Monthan AFB, AZ	Slight	Dampening of dirt roads for dust control	87.00
Dover AFB, NJ	Slight	Maintain proper contours; no major problem	2.00
Dyess AFB, TX	Slight	Diversion ditches and dikes are used to prevent damage from rapid runoff when construction is located where erosion can occur	1.50
Edwards AFB, CA	Slight	Road shoulders are maintained semi-annually by Air Force personnel	1.00-
Eglin Aux Fld No. 9, FL	Slight	None for normal on-grade construction; embankments are sodded, sprigged, or seeded as determined most appropriate for the particular grade consideration	0.00
Eglin AFB, FL	Slight	Contour grading and sod	100.00
Ellsworth AFB, SD	Slight	Contractors are only allowed to remove sod within grading limits of the contract; are also required to park in a restricted area to reduce erosive effects of traffic	2.00

Air Force base	Erodibility	Erosion control practices	Area currently denuded (acres)
England AFB, LA	Slight	This base has very flat terrain and erosion is not a problem; when revetments or steep slope ditches are constructed, seeding and/or straw and asphalt emulsion have been satisfactory to eliminate erosion	2.00
Ent AFB, CO	Slight	None during construction; seeding or sodding as soon as progress permits; in this semiarid region wind erosion is more significant than water erosion which occurs infrequently during heavy rainfall	4.00
Fairchild AFB, WA	Slight	None	0.00
Forbes AFB, KS	Slight	Grading as necessary to prevent runoff	0.00
F. E. Warren AFB, WY	Slight	Seeded crested wheat grass	32.00
George AFB, CA	Moderate	Normal practices for erosion control during construction; wetting down	15.00
Goodfellow AFB, TX	Slight	Erosion is not a problem in this area; trench is dug using dragline and dozer; composition of trench is approximately 2 feet of topsoil and 8 feet of caliche; caliche in bottom of trench will support trash trucks even in wet weather	5.00
Grand Forks AFB, ND	Slight	None needed; soil is not easily eroded	0.00
Griffiss AFB, NY	Slight	Specifications require contractor to maintain grades and vegetative cover to prevent erosion	0.00
Grissom AFB, IN	Slight	None	0.00
Gunter AFB, AL	Slight	None; refer to Maxwell AFB, AL, statistics	0.00
Hamilton AFB, CA	Slight	Drainage structures and planting	0.00

Air Force base	Erodibility	Erosion control practices	Area currently denuded (acres)
Hill AFB, UT	Slight	Very seldom is erosion a problem in a construction project; control of dust erosion is sometimes taken care of by watering as required	0.00
Holloman AFB, NM	Slight	None required	5.00
Homestead AFB, FL	Slight	None; soil in this area is primarily hard coral rock which does not erode easily; also, there is no appreciable elevation differential to create high water runoff velocities	0.00
Keesler AFB, MS	Slight	Grading to prevent rapid runoff during rain; vegetation reestablished as soon as possible	10.00
Kelly AFB, TX	Slight	Vegetative control; temporary berms or contours	0.00
Kincheloe AFB, MI	Slight	Construct show fences for wind break	2.00
Kingsley AFB, OR	Slight	Topography of base is relatively flat	0.00
Kirtland AFB, NM	Slight	Very little required due to low rainfall in the Albuquerque area	2.00
K. I. Sawyer AFB, MI	Slight	None required	0.00
Lackland AFB, TX	Slight	Drainage ditches are cut so as to let the water run off	6.00
Langley AFB, VA	Slight	Erosion control not of prime importance due to flat terrain	0.00
Laredo AFB, TX	Slight	None; very low rainfall and high wind	0.00
Laughlin AFB, TX	Slight	Sprigging	1.00
L. G. Hanscom Fld, MA	Slight	None at present	0.00
Little Rock AFB, AR	Slight	Seeded with suitable grass seed	100.00

Air Force base	Erodibility	Erosion control practice	Area currently denuded (acres)
Lockbourne AFB, OH	Slight	Lockbourne terrain is very flat; surface erosion of denuded soil is not a problem; temporary fill or excavation soil is stored in protected areas away from ditches and catch basins	0.00
Loring AFB, ME	Slight	Commonsense only; seeding, loaming, site restoration	0.00
Lowry AFB, CO	Slight	Grading to provide for proper drainage	0.00
Luke AFB, AZ	Slight	Due to limited annual rainfall, erosion is not a problem during construction	0.00
MacDill AFB, FL	Moderate	None; haul broken concrete, etc., to shoreline for rip-rap; sites are left bare until completion of project, then sod and/or seed is used for ground cover	150.00
Malmstrom AFB, MT	Slight	None required	7.00
March AFB, CA	Moderate	None	0.00
Mather AFB, CA	Slight	None needed because level terrain results in slight runoff and because of low annual rainfall	50.00
Maxwell AFB, AL	Slight	None; however, future contract specifications are being written to follow latest directives for construction site erosion controls	0.10
McChord AFB, WA	Slight	Area not subject to erosion	0.00
McClellan AFB, CA	Slight	None	0.00
McConnell AFB, KS	Slight	None	10.00
McCoy AFB, FL	Slight	All ground on base is level and therefore constitutes no erosion problem	0.00
McGuire AFB, NJ	Slight	Dust control by water tank truck	2.00

Air Force base	Erodibility	Erosion control practices	Area currently denuded (acres)
Minot AFB, ND	Slight	This area is relatively flat and little consideration is given to erosion control	1.00
Moody AFB, GA	Slight	Due to the mostly level terrain, erosion is almost nonexistent; however, where the terrain is not level, use of temporary drainage, sodding, seeding, burlap retainers is practiced	1.00
Mountain Home AFB, ID	Moderate	None	5.00
Myrtle Beach AFB, SC	Slight	Proper drainage of construction areas	1.00
Nellis AFB, NV	Slight	Landscaping	70.00
Norton AFB, CA	Slight	Landfill is stabilized with area drainage to prevent storm water from entering filled area	0.00
Offutt AFB, NE	Moderate	All contractors are controlled by project specifications; these require that adequate drainage be provided during entire construction period	17.00
Otis AFB, MA	Slight	None; does not apply now	0.00
Patrick AFB, FL	Slight	No current erosion problems during construction; areas denuded during construction are restored to original condition or better by seeding and/or sodding	1.00
Pease AFB, NH	Slight	None	N/A
Perrin AFB, TX	Slight	None; no construction planned or in progress now	N/A
Plattsburgh AFB, NY	Slight	None	0.00
Pope AFB, NC	Slight	N/A	2.00
Randolph AFB, TX	Slight	Sod, grass	5.00
Reese AFB, TX	Slight	None	2.00

Air Force base	Erodibility	Erosion control practices	Area currently denuded (acres)
Richard-Gebaur AFB, MO	Slight	New construction negligible; reseeding or sodding	0.00
Robins AFB, GA	Slight	None	0.00
Scott AFB, IL	Slight	None	4.00 to 5.00
Selfridge AFB, MI	Slight	When necessary sheet piling used	0.00
Seymour-Johnson AFB, NC	Slight	Erosion control practices not required because of flat area	0.00
Shaw AFB, SC	Slight	None	0.00
Sheppard AFB, TX	Slight	Contractor's responsibility; normally use some sort of an emulsion with a spray application	6.00
Tinker AFB, OK	Moderate	Topsoil stockpiled; replaced when resodding is accomplished	20.00
Travis AFB, CA	Slight	None	60.00
Tyndall AFB, FL	Slight	Normal construction drainage	0.00
Vance AFB, OK	Slight	Sod and terrace	0.00
Vandenberg AFB, CA	Severe	Check dams, spray-on (temporary), ice-plant sprigging, pave areas, mulch and seed, curb and off-culverts (roads), jute mesh and seed, rip-rap, ditch lining (steep) intercept ditches	0.00
Webb AFB, TX	Slight	None	2.00
Westover AFB, MA	Slight	None required ordinarily; area landscaped and seeded upon completion of construction	0.00
Whiteman AFB, MO	Slight	Grading and sodding	0.00
Williams AFB, AZ	Slight	None	0.00
Wright-Patterson AFB, OH	Slight	Flat area	0.00

Air Force base	Erodibility	Erosion control practices	Area currently denuded (acres)
Wurtsmith AFB, MI	Slight	Grading of site to prevent runoff; condition of soil (sand) prevents most erosion at construction site	0.75

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13. ABSTRACT

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A questionnaire survey of Air Force solid waste practices was conducted on all active Air Force installations. Information is presented on 98 major installations in the zone of interior (ZI) in the following areas: base and family housing solid wastes; grease disposal; garbage grinders; solid wastes generated in sewage treatment; pathological and classified wastes; liquid industrial wastes; fire fighting training, herbicides and pesticides, on-base landfill operations; and sedimentation from erosion.

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